

## References

- AIR RESOURCES LABORATORY, Gridded Meteorological Data Archives. 2009. <http://ready.arl.noaa.gov/archives.php>. Date of access: 14 Nov 2012.
- ANTHWAL, A., PARK, C-G., JUNG, K. & CO-AUTHORS. 2010. The Temporal and Spatial Distribution of Volatile Organic Compounds (VOCs) in the Urban Residential Atmosphere of Seoul, Korea. *Asian Journal of Atmospheric Environment*, 4-1:42-54. June.
- ATKINSON, R. 1989. Kinetics and mechanisms of the gas-phase reactions of the hydroxyl radical with organic compounds. *Journal of Physical and Chemical Reference Data*, 1:1-246.
- ATKINSON, R. 1994. Gas-phase tropospheric chemistry of organic compounds. *Journal of Physical and Chemical Reference Data: Monograph*: 216.
- ATKINSON, R. 1997. Gas-phase tropospheric chemistry of volatile organic compounds 1. Alkanes and alkenes. *Journal of Physical and Chemical Reference Data*, 26:215-290.
- ATKINSON, R. & AREY, J. 1998. Atmospheric chemistry of biogenic organic compounds. *Accounts of Chemical Research*, 31:574-583.
- ATKINSON, R., BAULCH, D. L., COX, R. A., HAMPSON, R. F., KERR, Jr., J. A., ROSSI, M. J. & TROE, J. 1999. Evaluated kinetic and photochemical data for atmospheric chemistry; Supplement VII-IUPAC sub-committee on gas kinetic data evaluation for atmospheric chemistry. *Journal of Physical and Chemical Reference Data*, 28:191-393.
- ATKINSON, R. 2000. Atmospheric chemistry of VOCs and NO<sub>x</sub>. *Atmospheric Environment*, 34(12-14):2063-2101.
- ATKINSON, R. & AREY, J. 2003. Gas-phase tropospheric chemistry of biogenic volatile organic compounds: a review. *Atmospheric Environment*, 37(Supplement 2):197-219.

- BALDASANO, J.M., DELGADO, R. & CALBÓ, J. 1998. Applying receptor models to analyse urban/suburban VOCs air quality in Martorell (Spain). *Environmental Science and Technology*, 32:405-412.
- BATES, M.S, GONZALEZ-FLESCA, N, SOKHI, R & COCHEO, V. 2000. Atmospheric volatile organic compound monitoring. Ozone induced artefact formation. *Environmental Monitoring and Assessment*, 65(1-2):89-97. November.
- BELL, M. L., MCDERMOTT, A., ZEGER, S.L., SAMET, J.M. & DOMINICI, F. 2004. Ozone and Short-term Mortality in 95 US Urban Communities 1987-2000. *Journal of the American Medical Association*, 292:2372-2378.
- BEUKES, J.P., VAKKARI, V., VAN ZYL, P.G., JAARS, K. & CO-AUTHORS. 2012. Source region plume characterisation of the interior of South Africa, as measured at Welgegund South Africa. In preparation for submission to *Atmospheric Chemistry and Physics Discussions*.
- BONN, B. & MOORTGAT, G. K. 2003. Sesquiterpene ozonolysis: origin of atmospheric new particle formation from biogenic hydrocarbons. *Geophysical Research Letter*, 30:1585-1588.
- BORBON, A., LOCOGE, N., VEILLEROT, M., GALLOO, J.C. & GUILLERMO, R. 2002. Characteristics of NMHCs in a French urban atmosphere: overview of the main sources. *The Science of the Total Environment*, 292:177-191.
- BOTTENHEIM, J. W., BARRIE, L. A., ATLAS, E., HEIDT, L. E., NIKI, H., RASMUSSEN, R. A. & SHEPSON, P.B. 1990. Depletion of lower tropospheric ozone during Arctic spring: The Polar Sunrise Experiment 1988. *Journal of Geophysical Research*, 95:18555-18568.
- BOTTENHEIM, J. W., BOUDRIES, H., BRICKELL, P. C. & ATLAS, E. 2002. Alkenes in the Arctic boundary layer at Alert, Nunavut, Canada. *Atmospheric Environment*, 36 (15-16):2585-2594. May-June.
- BRASSEUR, G, ORLANDO, J & TYNDALL, G. 1999. Atmospheric chemistry and global change. New York: Oxford University Press.

- BROCCO, D., FRATARCANGELI, R., LEPORE, L., PETRICCA, M. & VENTRONE, I. 1997. Determination of aromatic hydrocarbons in urban air of Rome. *Atmospheric Environment*, 31:557-566.
- BROWN, R. H. 1999. Monitoring the ambient environment with diffusive samplers: theory and practical considerations. *Journal of Environmental Monitoring*, 1(1):1-9.
- BRUNEKREEF, B. & HOLGATE, S.T. 2002. Air pollution and health: review. *The Lancet*, 360:1230-1240.
- BURGER, J.W. 2006. Identification and comparison of the volatile organic compound concentrations in ambient air in the Cape Town Metropolis and the Vaal Traingle. Potchefstroom.
- CAMELA, V. & CAUDE, M. 1995. Review: trace enrichment methods for the determination of organic pollutants in ambient air. *Journal of Chromatography*, 710:3-19.
- CARTER, W.P.L. 1994. Development of ozone reactivity scales for volatile organic compounds. *Journal of the Air and Waste Management Association organic compounds*, 44:881-899. 20 January.
- CHRISTENSEN, C.S., SKOV, H. & PALMGREN, F. 1999. C<sub>5</sub> to C<sub>8</sub> non-methane hydrocarbon measurements in Copenhagen: concentrations sources and emission estimates. *Science of the Total Environment*, 236:163-171.
- CLARKSON, T.S., MARTIN, R.J. & RUDOLPH, J. 1997. Ethane and propane in the southern marine troposphere. *Atmospheric Environment*, 31:3763-3771.
- COHEN, M.A., RYAN, P.B., SPENGLER, J.D., OZKAYNAK, H. & HAYES, C. 1991. Source-receptor study of volatile organic compounds and particulate matter in the Kanawha Valley-II. Analysis of factors contributing to VOC and particle exposures. *Atmospheric Environment*, 25B:95-107.
- COLÓN, M., PLEIL, J. A., HARTLAGE, T. A., GUARDANI, M. L. & MARTINS, M. H. 2001. Survey of volatile organic compounds associated with automotive emissions in the urban air shed of São Paulo, Brazil. *Atmospheric Environment*, 35(23): 4017-4031. August.

- DERWENT, R. G. & JENKIN, M. E. 1991. Hydrocarbons and the long-range transport of ozone and PAN across Europe. *Atmospheric Environment*, 25A:1661-1678.
- DERWENT, R.G., JENKIN, M.E., SAUNDERS, S.M. & PILLING, M.J. 1998. Photochemical ozone creation potentials for organic compounds in northwest Europe calculated with a master chemical mechanism. *Atmospheric Environment*, 32(14/15):2429-2441.
- DERWENT, R.G., DAVIES, T.J., DELANEY, M., DOLLARD, G.J., FIELD, R.A. & DUMITREAN, P. 2000. Analysis and interpretation of the continuous hourly monitoring data for 26 C<sub>2</sub>-C<sub>8</sub> hydrocarbons at 12 United Kingdom sites during 1996. *Atmospheric Environment*, 34:297-312.
- DRAXLER, R. R. & HESS, G. D. 2004. Description of the HYSPLIT 4 Modelling System.
- DUHL, T. R., HELMIG, D. & GUENTHER, A. 2008. Sesquiterpene emissions from vegetation: a review. *Biogeosciences*, 5:761-777, doi:10.5194/bg-5-761-2008.
- EDNEY, E.O., KLEINDIENST, T.E., CONVER, T.S., MCIVER, C.D., CORSE, E.W. & WEATHERS, E.W. 2003. Polar organic oxygenates in PM<sub>2.5</sub> at a southeastern site in the United States. *Atmospheric Environment*, 37:3947-3965.
- EPA. 1997. Compendium methods for the determination of toxic organic compounds in ambient air 2nd ed. EPA/625/R-96/-1-b. Cincinnati, OH: Central of Environmental Research Information.
- EPA. 2001. Water in a Changing World. Ecological Society of America.
- EPA. 2004. NOx Budget Trading Program 2003 progress and compliance report, Rep. EPA-430-R-04-010, Clean Air Markets Div., Off. of Air and Radiat. Washington, D. C.
- EPA. 2008. Part 51: requirements for preparation, adoption, and submittal of implementation plans.
- EPICA. 2004. Eight glacial cycles from an Antarctic ice core. *Nature*, 429:623-628.
- EVANS, R. C., TINGEY, D. T. & GUMPERTZ, M. L. 1985. Interspecies variation in terpenoid emissions from Engelmann and Sitka spruce seedlings. *Forest Science*, 31:132-142.

- FELLENBERG, G. 2000. The chemistry of pollution. John Wiley & Sons, Inc.
- FINESSI, E, DECESARI, S, PAGLIONE, M & CO-AUTHORS. 2012. Determination of the biogenic secondary organic aerosol fraction in the boreal forest by NMR spectroscopy. *Atmospheric Chemistry and Physics*, 12:941-959.
- FINLAYSON-PITTS, B. J. & PITTS, J. N. 2000. Chemistry of Upper and Lower Atmosphere. San Diego: Academic Press.
- FORSTNER, H.J.L., FLAGAN, R.C. & SEINFELD, J.H. 1997. Secondary organic aerosol from the photo oxidation of aromatic hydrocarbons: Molecular composition. *Environmental Science and Technology*, 31:1345-1358.
- FUENTES, J.D, LERDAU, M & ATKINSON, R. & CO-AUTHORS. 2000. Biogenic hydrocarbons in the atmospheric boundary layer: A review. *Bulletin of the American Meteorological Society*, 81(7):1537-75.
- FUJITA, E.M., STOCKWELL, W.R., CAMPBELL, D.E., KEISLAR, R.E. & ZIELINSKA, B. 2002. Weekend/weekday ozone observation in the south coast air basin: Volume II-Analysis of air quality dat. Alpharetta, GA.
- GELENCSEK, A., SISZLER, K. & HLAVAY, J. 1997. Toluene-Benzene concentration ratio as a tool for characterizing the distance from vehicular emission sources. *Environmental Science and Technology*, 31:2869-2872.
- GERON, C., HARLEY, P. & GUENTHER, A. 2001. Isoprene emission capacity for US tree species. *Atmospheric Environment*, 35(19):3341-3352. July.
- GEYER, A, ALICKE, B, KONRAD, S, SHMITZ, R, STUTZ, J & PLATT, U. 2001. Chemistry and oxidation capacity of the nitrate radical in the continental boundary layer near Berlin. *Journal of Geophysical Research*, 106:8013-8025.
- GHAN, S. 2011. Aerosol Climate Initiative.  
[http://www.pnl.gov/atmospheric/research/aci/aci\\_aerosol\\_indeffects.stm](http://www.pnl.gov/atmospheric/research/aci/aci_aerosol_indeffects.stm). Date of access: 13 September 2011.
- GLOBAL WARMING ART, (Image created by Robert A. Rohde). 2006.  
[http://www.globalwarmingart.com/wiki/File:Carbon\\_Dioxide\\_400kyr\\_Rev\\_png](http://www.globalwarmingart.com/wiki/File:Carbon_Dioxide_400kyr_Rev_png).  
Date of access: 20 November 2012.

- GODISH, T. 1991. Air Quality. Chelsea: MI: Lewis Publishers Inc.
- GODISH, T. 2004. Air quality. New York: Lewis Publishers.
- GOVERNMENT GAZETTE. 2004. National Environmental Management Air Quality Act of 2004 section 63. <http://www.info.gov.za>. Date of access: 23 Oct 2012.
- GOVERNMENT GAZETTE, 14 October 2005 No. 28132. 2005. <http://www.info.gov.za/view/DownloadFileAction?id=61585>. Date of access: 23 Oct 2012.
- GOVERNMENT GAZETTE, 4 May 2007 No. 29864. 2007. <http://www.info.gov.za/view/DownloadFileAction?id=73046>. Date of access: 23 Oct 2012.
- GOVERNMENT GAZETTE, 15 June 2012 No. 35435. 2012. <http://www.info.gov.za/view/DownloadFileAction?id=167264>. Date of access: 14 Nov 2012.
- GREENBERG, J. P., GUENTHER, A. B., HARLEY, P., OTTER, L., VEENENDL, E. M., HEWITT, C. N., JAMES, A. E. & OWEN, S. M. 2003. Eddy flux and leaf-level measurements of biogenic VOC emissions from mopane woodland of Botswana. *Journal of Geophysical Research*, 108, doi 10.1029/2002JD002317.
- GRIFFIN, R. J., COCKER III, D. R., SEINFELD, J. H. & DABDUB, D. 1999. Estimate of global atmospheric organic aerosol from oxidation of biogenic hydrocarbons. *Geophysical Research Letters*, 26:2721-2724.
- GROSJEAN, D. 1992. In situ organic aerosol formation during a smog episode: estimated production and chemical functionality. *Atmospheric Environment*, 26A:953-963.
- GROSJEAN, E., GROSJEAN, D. & RASMUSSEN, R.A. 1998. Ambient Concentrations, Sources, Emission Rates, and Photochemical Reactivity of C<sub>2</sub>-C<sub>10</sub> Hydrocarbons in Porto Alegre, Brazil. *Environmental Science and Technology*, 32:2061-2069.
- GROS, V., MARTIN, D., POISSON, N., KANAKIDOU, M., BONSSANG, B., LE GUERN, F. & DEMONT, E. 1998. Ozone and C<sub>2</sub>-C<sub>5</sub> hydrocarbon observations in the marine boundary layer between 45 S and 77 S. *Tellus*, 50B:430-448.

- GUENTHER, A., MONSON, R.K. & FALL, R. 1991. Isoprene and monoterpene emission rate variability: observations with eucalyptus and emission rate algorithms development. *Journal of Geophysical Research*, 96:10799-10808.
- GUENTHER, A., ZIMMERMAN, P., HARLEY, P., MONSON, R. & FALL, R. 1993. Isoprene and monoterpene emission rate variability: Model evaluation and sensitivity analysis. *Journal of Geophysical Research*, 98:12609-12617.
- GUENTHER, A, HEWITT, C. N, ERICKSON, D, FALL, R, GERON, C, GRAEDEL, T, HARLEY, P, KLINGER, L, LERDAU, M, MCKAY, W.A, PIERCE, T, SCHOLE, B, STEINBRECHER, R, TALLAMRAJU, R, TAYLOR, J & ZIMMERMAN, P. A. 1995. Global-Model of Natural Volatile Organic-Compound Emissions. *Journal of Geophysical Research*, 100(D5):8873-8892.
- GUENTHER, A., OTTER, L.B., ZIMMERMAN, P., GREENBERG, J., SCHOLE, R. & SCHOLE, M. C. 1996. Biogenic hydrocarbon emissions from southern Africa savannas. *Journal of Geophysical Research*, 101:25859-25865.
- GUENTHER, A. 2002. The contribution of reactive carbon emissions from vegetation to the carbon balance of terrestrial ecosystems. *Chemosphere*, 49(8):837-44.
- GUENTHER, A., KARL, T., HARLEY, P., WIEDINMYER, C., PALMER, P.I. & GERON, C. 2006. Estimates of global terrestrial isoprene emissions using MEGAN (Model of Emissions of Gases and Aerosols from Nature). *Atmospheric Chemistry and Physics*, 6:3181-3210, doi:10.5194/acp-6-3181-2006,
- GUICHERIT, R. 1997. Traffic as a source of volatile hydrocarbons in ambient air. *Science Total Environment*, 205:201-213.
- GUO, H., SO, K.L., SIMPSON, I.J., BARLETTA, B., MEINARDI, S. & BLAKE, D.R. 2007. C<sub>1</sub>-C<sub>8</sub> volatile organic compounds in the atmosphere of Hong Kong: overview of atmospheric processing and source apportionment. *Atmospheric Environment*, 41:1456-1472.
- HAAGEN-SMIT, A.J. & FOX, M.M. 1956. Ozone formation in photochemical oxidation of organic substance. *Industrial and Engineering Chemistry*, 48:1484-1487.

- HAKOLA, H., RINNE, J. & LAURILA, T. 1998. The hydrocarbon emission rates of tea-leaved willow (*Salix phylicifolia*), Silver birch (*Betula pendula*) and European aspen (*Populus tremula*). *Atmospheric Environment*, 32:1825-1833.
- HAKOLA, H., TARVAINEN, V., LAURILA, T., HILTUNEN, V., HELLÉN, H. & KERONEN, P. 2003. Seasonal variation of VOC concentrations above a boreal coniferous forest. *Atmospheric Environment*, 37:1623–1634.
- HAMILTON, J.F., P.J., Webb, LEWIS, A.C, HOPKINS, J.R., SMITH, S. & DAVY, P. 2004. Partially oxidized organic components in urban aerosol using GCxGC-TOF/MS. *Atmospheric Chemistry and Physics*, 4:1279-1290.
- HAMILTON, J. F., WEBB, P. J., LEWIS, A. C. & REVIEJO, M.M. 2005. Quantifying small molecules in secondary organic aerosol formed during the photo-oxidation of toluene with hydroxyl radicals. *Atmospheric Environment*, 39:7263-7275.
- HARRISON, R.M. 1999. Understanding our environment. An introduction to environmental chemistry and pollution. Royal Society of Chemistry.
- HARRISON, D., HUNTER, M.C., LEWIS, A.C., SEAKINS, P.W., NUNES, T.V. & PIO, C.A. 2001. Isoprene and monoterpene emission from the coniferous species *Abies Borisii-regis*\*implications for regional air chemistry in Greece. *Atmospheric Environment*, 35:4687-4698.
- HELLÉN, H., HAKOLA, H., LAURILA, T., HILTUNEN, V. & KOSKENTALO, T. 2002. Aromatic hydrocarbon and methyl tert-butyl ether measurements in ambient air of Helsinki (Finland) using diffusive sampling. *Science of the Total Environment*, 298:55-64.
- HELLÉN, H., HAKOLA, H., PYSTYNEN, K.-H., RINNE, J. & HAAPANALA, S. 2006a. C<sub>2</sub>-C<sub>10</sub> hydrocarbon emissions from a boreal wetland and forest floor. *Biogeosciences*, 3:167-174.
- HELLÉN, H. 2006b. Sources and concentrations of volatile organic compounds in urban air. Helsinki.



- HELLÉN, H., KURONEN, P. & HAKOLA, H. 2012a. Heated stainless steel tube for ozone removal in the ambient air measurements of mono- and sesquiterpenes. *Atmospheric Environment*, 57:35–40. September.
- HELLÉN, H., LECK, C., PAATERO, J., VIRKKULA, A. & HAKOLA, H. 2012b. Summer concentrations of NMHCs in ambient air of the Arctic and Antarctic. *Boreal Environment Research*, 17(5): 385-397.
- HEWITT, C.N. 1999. Reactive hydrocarbons in the atmosphere. San Diego: Academic Press.
- HIRSIKKO, A., VAKKARI, V., TIITTA, P., MANNINEN, H.E. & CO-AUTHORS. 2012. Characterisation of sub-micron particle number concentrations and formation events in the western Bushveld Igneous Complex, South Africa. *Atmospheric Chemistry and Physics Discussions*, 12:1895-1934.
- HOBBS, P. V. 2000. Introduction to atmospheric chemistry. Cambridge: Cambridge University Press.
- HOFFMAN, T., ODUM, J.R., BOWMAN, F., D., COLLINS, KLOCKOW, D., FLAGAN, R. C. & SEINFELD, J.H. 1997. Formation of organic aerosols from the oxidation of biogenic hydrocarbons. *Journal of Atmospheric Chemistry*, 26:189-222.
- HOLZINGER, R., KLEIS, B., DONOSO, L. & SANHUEZA, E. 2001. Aromatic hydrocarbons at urban, sub-urban, rural (81520N; 671190W) and remote sites in Venezuela. *Atmospheric Environment*, 35:4917-4927.
- HOQUE, R.R., KHILLARE, P.S., AGARWAL, T., SHRIDHAR, V. & BALACHANDRAN, S. 2008. Spatial and temporal variation of BTEX in the urban atmosphere of Delhi, India. *Science of the Total Environment*, 392(1):30-40.
- HOUGHTON, R. A. 2003. Revised estimates of the annual net flux of carbon to the atmosphere from changes in land use and land management. *Tellus Series B-Chemical and Physical Meteorology*, 55:378-390.
- HSIEH, C.C. & TSAI, J.H. 2003. VOC concentration characteristics in Southern Taiwan. *Chemosphere*, 50:545-556.
- IAQM. 2012. <http://www.iaqm.com/toxins.html> Date of access: 22 November 2012.

- IPCC. 2007. IPCC fourth assessment report: climate change 2007.
- JENKIN, M. E. & D., Hayman G. 1999. Photochemical ozone creation potentials for oxygenated volatile organic compounds: sensitivity to variations in kinetic and mechanistic parameters. *Atmospheric Environment*, 33:1275-1293.
- JENKIN, M.E., SAUNDERS, S.M., WAGNER, V. & PILLING, M.J. 2003. Protocol for the development of the Master Chemical Mechanism, MCM v3 (Part B): tropospheric degradation of aromatic volatile organic compounds. *Atmospheric Chemistry and Physics*, 3:181-193.
- JOBSON, B. T., NIKI, H., YOKOUCHI, Y., BOTTENHEIM, J., HOPPER, F. & CO-AUTHORS. 1994. Measurements of C<sub>2</sub>-C<sub>6</sub> hydrocarbons during the Polar Sunrise 1992 Experiment: Evidence for Cl atom and Br atom chemistry. *Journal of Geophysical Research*, 99:25355-25368.
- JOSIPOVIC, M., ANNERGARN, H.J., KNEEN, M.A., PIENAAR, J.J. & PIKETH, S.J. 2011. Atmospheric dry and wet deposition of sulphur and nitrogen species and assessment of critical loads of nitrogen species and assessment of critical loads of. *South African Journal of Science*, 107 (3/4):10.
- JOSE, M.B., ROSE, D. & JOSEP, C. 1998. Applying receptor models to analyze urban/suburban VOCs air quality in Martorell (Spain). *Environmental Science and Technology*, 32:405-412.
- KARL, M., GUENTHER, A., KBLE, R., LEIP, A. & SEUFERT, G. 2009. A new European plant-specific emission inventory of biogenic volatile organic compounds for use in atmospheric transport models. *Biogeosciences*, 6:1059-1087, doi:10.5194/bg-6-1059-2009.
- KAMPA, M & CASTANAS, E. 2008. Human health effects of air pollution. *Environmental Pollution*, 151(2):362-367.
- KANAKIDOU, M., SEINFELD, J.H., PANDIS, S. N., BARNES, I., DENTENER, F. J. & CO-AUTHORS. 2005. Organic aerosol and global climate modelling: a review. *Atmospheric Chemistry and Physics*, 5:1053-1123.

- KASPERS, K. A., VAN DE WAL, R. S. W., DE GOUW, J. A., HOFSTEDDE, C. M., VAN DEN BROEKE, M. R. & CO-AUTHORS. 2004. Analyses of firn gas samples from Dronning Maud Land, Antarctica: Study of nonmethane hydrocarbons and methyl chloride. *Journal of Geophysical Research*, 109: D02307.
- KEELING, C. D, PIPER, S.C, BACASTOW, R.B, WAHLEN, M, WHORF, T.P, HEIMANN, M & MEIJER, H. A. 2005. "Atmospheric CO<sub>2</sub> and <sup>13</sup>CO<sub>2</sub> exchange with the terrestrial biosphere and oceans from 1978 to 2000: observations and carbon cycle implications." In *A History of Atmospheric CO<sub>2</sub> and Its Effects on Plants, Animals, and Ecosystems*. New York: Springer.
- KERBACHI, R., BOUGHEDAOU, M., BOUNOUA, L. & KEDDAM, M. 2006. Ambient air pollution by aromatic hydrocarbons in Algiers. *Atmospheric Environment*, 40:3995-4003.
- KESSELMEIER, J. & CO-AUTHORS. 1996. Emission of monoterpenes and isoprene from a Mediterranean oak species *Quercus ilex* L. measured within the BEMA (Biogenic Emissions in the Mediterranean Area) project. *Atmospheric Environment*, 30(10-11):1841-1850. May.
- KESSELMEIER, J. & STAUDT, M. 1999. Biogenic volatile organic compounds (VOC): An overview on emission, physiology and ecology. *Journal of Atmospheric Chemistry*, 33:23-88.
- KESSELMEIER, J, CICCIOLO, P & KUHN, U. & CO-AUTHORS. 2002. Volatile organic compound emissions in relation to plant carbon fixation and the terrestrial budget. *Global Biogeochemical cycles*, 16(4):1126.
- KHODER, M.I. 2007. Ambient levels of volatile organic compounds in the atmosphere of Greater Cairo. *Atmospheric Environment*, 41:554-66.
- KIM, Y, SARTELET, K & SEIGNEUR, C. 2011. Formation of secondary aerosols over Europe: comparison of two. *Atmospheric Chemistry and Physics*, 11:583-598.
- KLOUDA, G.A, KLINEDINST, D.B, STEEL, E.B, BENNER, B.A., & PARISH, H.J. 1996. Exploring a method to produce an urban dust particle filter standard. *Journal of Aerosol Science*, 27:351-352.

- KOPPMANN, R. 2007. Volatile Organic Compounds in the Atmosphere: An Overview. In: KOPPMANN, R., ed. Volatile organic compounds in the atmosphere, 1 st ed. ed. Blackwell Publishing Ltd.
- KUZMA, J. & FALL, R. 1993. Leaf Isoprene Emission Rate Is Dependent on Leaf Development and the Level of Isoprene Synthase. *Plant Physiology*, 101:435-440.
- LAAKSO, L., LAAKSO, H., AALTO, P.P., KERONEN, P., PETÄJÄ, T., NIEMINEN, T., POHJA, T., SIVOLA, E., KULMALA, M., KGABI, N., MOLEFE, M., MABASO, D., PHALATSE, D., PIENAAR, K. & KERMINEN, V.-M. 2008. Basic characteristics of atmospheric particles, trace gases and meteorology in a relatively clean Southern African Savannah environment. *Atmospheric Chemistry and Physics*, 8:4823-4839.
- LAURILA, T., TUOVINEN, J.-P., TARVAINEN, V. & SIMPSON, D. 2004. Trends and scenarios of ground-level ozone concentrations in Finland. *Boreal Environment Research*, 9:167-184.
- LEE, S.C., CHIU, M.Y., HO, K.F., ZOU, S.C. & WANG, X. 2002. Volatile organic compounds (VOCs) in urban atmosphere of Hong Kong. *Chemosphere*, 48:375-382.
- LERDAU, M., GUENTHER, A. & MONSON, R. 1997. Plant production and emission of volatile organic compounds. *Bioscience*, 47:373-383.
- LIEBENBERG-ENSLIN, H., THOMAS, R., WALTON, N. & VAN NIEROP, M. 2007. Vaal Triangle priority area air quality management plan - Baseline characterization.
- LIPPMAN, M. 1992. Environmental Toxicants: Human exposure and their health effects. NY: Van Nostrand Reinhold.
- LIU, C., XU, Z., DU, Y. & GUO, H. 2000. Analyses of volatile organic compounds concentrations and variation trends in the air of Changchun, the northeast of China. *Atmospheric Environment*, 34:4459-4466.
- LOURENS, A.S.M. 2008. Spatial and temporal assessment of pollutants in the Highveld Priority Area, South Africa. Potchefstroom.

- LOURENS, A.S., BEUKES, J.P., VAN ZYL, P.G., FOURIE, G.D., BURGER, J.W., PIENAAR, J.J., READ, C.E. & JORDAAN, J.H. 2011. Spatial and temporal assessment of gaseous pollutants in the Highveld of South Africa. *South African Journal of Science*, 269(107):8.
- LOURENS, A.S.M., BUTLER, T.M. & BEUKES, J.P. 2012. Re-evaluating the NO<sub>2</sub> hotspot over the South African Highveld. *South African Journal of Science*, 108 (11/12).
- MAGE, D, OZOLINS, G, PETERSON, P., Webster, A, ORTHOFER, R, VANDERWEED, V & GWYNNE, M. 1996. Urban Air Pollution in Megacities of the World. *Atmospheric Environment*, 30(5):681-686.
- MARTINS, J. J. 2008. Concentration and deposition of atmospheric species at regional sites in Southern Africa. Potchefstroom.
- MATLAB. 2010. version 7.10.0 (R2010a). 24 Prime Park Way, Natick, MA, 01760-1500, USA.: The MathWorks Inc.
- MCCLENNY, W.A., OLIVER, K.D. & PLELL, J.D. 1989. A field strategy for sorting volatile organics into source-related groups. *Environmental Science and Technology*, 23:1373-1379.
- MONOD, A., SIVE, B.C., AVINO, P., CHEN, T., BLAKE, D.R. & ROWLAND, F.S. 2001. Monoaromatic compounds in ambient air of various cities: a focus on correlations between the xylenes and ethylbenzene. *Atmospheric Environment*, 35(1):135-149.
- MONSON, R.K., JAEGER, C. H., ADAMS, W. W., DRIGGERS, E. M., SILVER, G. M. & FALL, R. 1992. Relationships among Isoprene Emission Rate, Photosynthesis, and Isoprene Synthase Activity as Influenced by Temperature. *Plant Physiology*, 98:1175-1980.
- MONSON, R.K., HARLEY, P.C., LITVAK, M.E., WILDERMUTH, M., GUENTHER, A.B., ZIMMERMAN, P.R. & FALL, R. 1994. Environmental and developmental controls over the seasonal pattern of isoprene emission from aspen leaves. *Oecologia*, 99:260-270.

- MONSON, R.K., LERDAU, M.T., SHARKEY, T.D., SCHIMEL, D.S. & FALL, R. 1995. Biological aspects of constructing volatile compound emission inventories. *Atmospheric Environment*, 29:2989-3002.
- MOSCHONAS, M.F. & CLAVAS, S. 1996. C<sub>3</sub>-C<sub>10</sub> hydrocarbons in the atmosphere of Athens, Greece. *Atmospheric Environment*, 30(15):2769-2772.
- NA, K. & KIM, Y.P. 2001. Seasonal characteristics of ambient volatile organic compounds in Seoul, Korea. *Atmospheric Environment*, 35:2603-2614.
- NA, K., MOON, K-C. & KIM, Y.P. 2005. Source contribution to aromatic VOC concentration and ozone formation potential in the atmosphere of Seoul. *Atmospheric Environment*, 39:5517-5524.
- NGUYEN, H.T., KIM, K.H. & KIM, M.Y. 2009. Volatile organic compounds at an urban monitoring station in Korea. *Journal of Hazardous Materials*, 161:163-174.
- NRC, (National Research Council). 1991. Committee on Tropospheric Ozone Formation and Measurement. Rethinking the Ozone Problem in Urban and Regional Air Pollution, National Academy Press.
- NRC, (National Research Council). 2008. Estimating Mortality Risk Reduction and Economic Benefits from Controlling Ozone Air Pollution. Washington D.C.: National Academies Press.
- OTTER, L.B., GUENTHER, A. & GREENBERG, J. 2002. Seasonal and spatial variations in biogenic hydrocarbon emissions from southern African savannas and woodlands. *Atmospheric Environment*, 36:4265-4275.
- OTTER, L., GUENTHER, A., WIEDINMYER, C., FLEMING, G., HARLEY, P. & Greenberg, J. 2003. Spatial and temporal variations in biogenic volatile organic compound emissions for Africa south of the equator. *Journal of Geophysical Research*, 108(D13):8505.
- PANDIS, S., HARLEY, R. A., CASS, G. R. & SEINFELD, J. H. 1992. Secondary organic aerosol formation and transport. *Atmospheric Environment*, 26A:2269-2282.

- PARRA, M. A., ELUSTONDO, D. & GARRIGO, J. 2006. Spatial and temporal trends of volatile organic compounds (VOC) in a rural area of northern Spain. *Science of the Total Environment*, 370(1):157-167. 15 October.
- PARRISH, D. D, TRAINER, M, HEREID, D, WILLIAMS, E. J, OLSZYNA, K. J, HARLEY, R. A, MEAGHER, J.F & FEHSENFELD, F.C. 2002. Decadal change in carbon monoxide to nitrogen oxide ratio in U.S. vehicular emissions. *Journal of Geophysical Research*, 107(D12)
- PINHO, P.G., PIO, C.A. & JENKIN, M.E. 2005. Evaluation of isoprene degradation in the detailed tropospheric chemical mechanism, MCM v3, using environmental chamber data. *Atmospheric Environment*, 39:1303-1322.
- PRESTON-WHYTE, R.A. & TYSON, R.D. 1988. The atmosphere and weather of Southern Africa. Cape Town: Oxford University Press.
- PUTAUD, J.-P, VAN DINGENEN, R, ALASTUEY, A & BAUER, H, et al. 2010. A European aerosol phenomenology - 3: Physical and chemical characteristics of particulate matter from 60 rural, urban, and kerbside sites across Europe. *Atmospheric Environment*, 44:1308-1320.
- RAPPENGLÜCK, B. & FABIAN, P. 1999. Nonmethane hydrocarbons (NMHC) in the greater Munich area/Germany. *Atmospheric Environment*, 33:3843-3857.
- READ, A.R., LEWIS, A.C., SALMON, R.A. & CO-AUTHORS. 2007. OH and halogen atom influence on the variability of non-methane hydrocarbons in the Antarctic Boundary Layer. *Tellus*, 59B:22-38.
- REASON, C.J.C., ENGELBRECHT, F., LANDMAN, W.A., LURJEHARMS, J.R.E., PIKETH, S., RAUTENBACH, C.J. & HEWLTSON, B.C. 2006. A review of South African research in atmospheric science and physical oceanography during 2000-2005. *South African Journal of Science*, 102:35-45. January/February

- RICKARD, A.R., SALISBURY, G., MONKS, P.S., LEWIS, A.C., BAUGITTE, S., BANDY, B.J., CLEMITSHAW, K.C. & PENKETT, S.A. 2002. Comparison of measured ozone production efficiencies in the marine boundary layer at two European coastal sites under different pollution regimes. *Journal of Atmospheric Chemistry*, 43:107-134.
- RORICH, R.P & GALPIN, J.S. 1998. Air quality in the Mpumalanga Highveld region, South Africa. *South African Journal of Science*, 94:109-114.
- SANADZE, G. A. 1991. Isoprene effect-light dependent emission of isoprene by green parts of plants, in T. D. Sharkey, E. A. Holland, and H. A. Mooney (eds). In: Trace Gas Emissions from Plants, San Diego: Academic Press.
- SAUNDERS, S.M., JENKIN, M.E., DERWENT, R.G. & PILLING, M.J. 2002. Protocol for the development of the Master Chemical Mechanism, MCM v3 (Part A): tropospheric degradation of non-aromatic volatile organic compounds. *Atmospheric Chemistry and Physics Discussions*, 2:1847-1903.
- SCHOLES, R.J. & SCHOLES, M.C. 1997. Natural and human-related sources of ozone-forming trace gases in southern Africa. *South African Journal of Science*, 93:1-4.
- SEINFELD, J. H. & PANDIS, S. N. 1998. Atmospheric chemistry and physics: from air pollution to climate change. Wiley: Chichester.
- SEINFELD, J.H & PANDIS, S.N. 2006. Atmospheric chemistry and physics. New Jersey: John Wiley & Sons, Inc.
- SHARKEY, T.D. & LORETO, F. 1993. Water stress, temperature, and light effects on the capacity for isoprene emission and photosynthesis of kudzu leaves. *Oecologia*, 95(3):328-333. September.
- SILLMAN, S. 1999. The relation between ozone, NO<sub>x</sub> and hydrocarbons in urban and polluted rural environments. *Atmospheric Environment*, 33:1821-1845.
- SIMON, V., CLEMENT, B., RIBA, M.-L. & TORRES, L. 1994. The Landes experiment: Monoterpenes emitted from the maritime pine. *Journal of Geophysical Research*, 99:16501-16510.



- SIMON, V., BAER, M., TORRES, L., OLIVIER, S., MEYBECK, M. & DELLA MASSA, J.P. 2004. The impact of reduction in the benzene limit value in gasoline on airborne benzene, toluene and xylenes levels. *Science of the Total Environment*, 334-335:177-183.
- SINGLA, V., PACHAURI, T., SATSANGI, A. & CO-AUTHORS. 2012. Comparison of BTX Profiles and Their Mutagenicity Assessment at Two Sites of Agra, India. *The Scientific World Journal*, 2012: 272853.
- SITHOLE, N.P. 2012. Phase equilibrium studies of sulfolane mixtures containing carboxylic acids. Durban.
- STAUDT, M. & SEUFERT, G. 1995. Light-dependent emission of monoterpenes by Holm Oak (*Quercus ilex* L.). *Naturwissenschaften*, 82:89-92.
- STEVENSON, K.J., STACEY, B., WILLIS, P.G. 1997. Air Quality at Heathrow Airport. Annual Report for 1996. AEA Technology, 1997.
- SUWA, T, HOGG, C, QUINLAN, K.B, OHGAMI, A, VINCENT, R & VAN EEDEN, S.F. 2002. Particulate air pollution induces progression of Atherosclerosis. *Journal of the American College of Cardiology*, 39(6):935-945. Mar.
- SWANSON, A. L., BLAKE, N. J., DIBB, J. E., ALBERT, M. R., BLAKE, D. R. & CO-AUTHORS. 2002. Photochemically induced production of CH<sub>3</sub>Br, CH<sub>3</sub>I, C<sub>2</sub>H<sub>5</sub>I, ethene, and propene within surface snow at Summit, Greenland. *Atmospheric Environment*, 36:2671-2682.
- SWAP, R. J, ANNEGARN, H. J, SUTTLES, J. T, KING, M. D, PLATNICK, S, PRIVETTE, J. L & SCHOLE, R. J. 2003. Africa burning: a thematic analysis of the Southern African regional science initiative (SAFARI 2000). *Journal of Geophysical Research*, 108:8465
- TERBLANCE, A.P.S., NEL, R. & RAVENSCROFT, G. 1996. Milnerton and surrounding areas air quality project. 1 October 1994 - 30 September 1995. Report to the steering committee. Issued by: CSIR environmental services, Pretoria.
- TINGEY, D. T., EVANS, R. & GUMPERTZ, M. 1981. Effects of environmental conditions on isoprene emissions from live oak (*Quercus virginiana*). *Planta*, 152:565-570.

- TORRES-JARDÓN, R. 2004. Comparative Assessment of the Sensitivity of Ozone to Nitrogen Oxides and Volatile Organic Compounds in Two Dissimilar Metropolitan Areas of North America: Cincinnati, OH (U.S.A.) and Mexico City, DF (Mexico). Cincinnati.
- TRAN, N.K., STEINBERG, S.M. & JOHNSON, B.J. 2000. Volatile aromatic hydrocarbons and dicarboxylic acid concentrations in air at an urban site in the Southwestern US. *Atmospheric Environment*, 34:1845-1852.
- TYSON, P. D., GARSTANG, M., SWAP, R., KALLBERG, P. & EDWARDS, M. 1996. An air transport climatology for subtropical southern Africa. *International Journal of Climatology*, 16(3):265-291. March.
- VAKKARI, V., LAAKSO, H., KULMALA, M., LAAKSONEN, A., MABASO, D., MOLEFE, M., KGABI, N. & LAAKSO, L. 2011. New particle formation events in semi-clean South African savannah, *Atmospheric Chemistry Physics*, 11:3333-3346.
- VAN DER WALT, H.J. 2008. The impact of hydrocarbon emissions on regional air quality in a South African metropolitan area. Potchefstroom.
- VAN DER WESTHUIZEN, H., TAYLOR, A.B., BELL, A.J. & MBARAWA, M. 2004. Evaluation of evaporative emissions from gasoline-powered motor vehicles under South African conditions. *Atmospheric Environment*, 38:2909-2916
- VENTER, A.D., VAKKARI, V., BEUKES, J.P., VAN ZYL, P.G. & CO-AUTHORS. 2012. An air quality assessment in the industrialised western Bushveld Igneous Complex, South Africa. *South African Journal of Science*, 108(9/10).
- VINGARZAN, 2004. 2004. A review of surface ozone background levels and trends. *Atmospheric Environment*, 38:3431-3442.
- WANG, X.M., SHENG, G.Y., FUM, J.M. & CO-AUTHORS. 1993. Urban roadside aromatic hydrocarbons in three cities of the Pearl River Delta, People's Republic of China. *Atmospheric Environment*, 36:5141-5148.
- WANG, Z. H., BAI, Y. H. & ZHANG, S. Y. 2003. A biogenic volatile organic compounds emission inventory for Beijing. *Atmospheric Environment*, 37:3771-3782, doi:10.1016/S1352-2310(03)00462-X.

- WANG, Q. G., HAN, Z. W., WANG, T. J. & HIGANO, Y. 2007. An estimate of biogenic emissions of volatile organic compounds during summertime in China. *Environmental Science and Pollution Research*, 14(1):69-75.
- WELGEGUND. 2010. <http://www.welgegund.org>. Date of access: 7 October 2012.
- WHO, (World Health Organization). 1999. Air Quality Guidelines for Europe. WHO Regional Publication, European Series. World Health Organization. Regional Office for Europe, Copenhagen.
- WHO, (World Health Organization). 2000. Air Quality Guidelines for Europe. 2nd edition. Copenhagen: WHO Regional Publications. European Series, No. 91.
- WHO, (World Health Organization). 2002. The world health report 2002: reducing risks, promoting healthy life. Geneva: UN. 230 p.  
[http://www.who.int/whr/2002/en/whr02\\_en.pdf](http://www.who.int/whr/2002/en/whr02_en.pdf) Date of access: 8 October 2012.
- WHO, (World Health Organization). 2007. Health relevance of particulate matter from various sources. Germany.
- WILLIAMSON, S.J. 1973. Fundamentals of Air Pollution, Addison-Wesley, Reading, Massachusetts.
- WOOLFENDEN, E. 1997. Monitoring VOC's in air using sorbent tubes followed by thermal desorption-capillary GC analysis: Summary of data and practical guidelines. *Journal of Air and Waste Management Association*, 47:20-36.
- WYNGAARDT, G. 2011. Temporal assessment of atmospheric trace metals in the industrialised western Bushveld Complex. Potchefstroom.
- YU, J. & JEFFRIES, H. E. 1997. Atmospheric photooxidation of alkylbenzenes-II. Evidence of formation of epoxide intermediates. *Atmospheric Environment*, 31:2281-2287.
- YU, J., JEFFRIES, H.E. & SEXTON, K.G. 1997. Atmospheric photo-oxidation of alkylbenzenes-I. Carbonyl product analyses. *Atmospheric Environment*, 31:2261-2280.

- ZABIEGAŁA, B., GÓRECKI, T., PRZYK, E. & NAMIEŚNIK, J. 2002. Permeation passive sampling as a tool for the evaluation of indoor air quality. *Atmospheric Environment*, 36(17):2907-2916, Jun.
- ZHENG, J. Y., ZHENG, Z. Y., YU, Y. F. & ZHONG, L. J. 2010. Temporal, spatial characteristics and uncertainty of biogenic VOC emissions in the Pearl River Delta region, China. *Atmospheric Environment*, 44:1960-1969.
- ZUNCKEL, CHILOANE, K, SOWDEN, M & OTTER, L. 2007. Biogenic volatile organic compounds: The state of knowledge in southern Africa and the challenges for air quality management. *South African Journal of Science*, 103(3/4):107. March/April.

# Appendix A

Table A.1: Aromatic hydrocarbon concentrations for Welgegund

|                      |               | 2011  |       |       |       |       |       |       |       |       |       |       | 2012  |       | Annual mean |
|----------------------|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|
|                      |               | Febr  | March | April | May   | June  | July  | Aug   | Sept  | Oct   | Nov   | Dec   | Jan   | Febr  |             |
| <b>Benzene</b>       | <b>Mean</b>   | 0.268 | 0.179 | 0.084 | 0.549 | 0.176 | 0.154 | 0.158 | 0.200 | 0.213 | 0.826 | 0.278 | 0.375 | 0.387 | 0.29        |
|                      | <b>SD</b>     | 0.085 | 0.099 | 0.031 | 1.682 | 0.242 | 0.085 | 0.072 | 0.063 | 0.261 | 2.228 | 0.209 | 0.998 | 0.352 |             |
|                      | <b>Median</b> | 0.260 | 0.180 | 0.082 | 0.089 | 0.104 | 0.139 | 0.146 | 0.189 | 0.141 | 0.103 | 0.224 | 0.146 | 0.387 |             |
|                      | <b>Max</b>    | 0.452 | 0.382 | 0.133 | 7.192 | 0.959 | 0.373 | 0.311 | 0.312 | 1.201 | 8.730 | 0.826 | 4.363 | 0.636 |             |
| <b>Toluene</b>       | <b>Mean</b>   | 2.482 | 1.603 | 0.916 | 1.183 | 0.693 | 0.618 | 0.807 | 0.382 | 0.529 | 0.715 | 0.580 | 0.696 | 0.547 | 0.89        |
|                      | <b>SD</b>     | 0.731 | 0.715 | 0.243 | 1.282 | 0.228 | 0.132 | 0.394 | 0.248 | 0.285 | 1.112 | 0.140 | 0.577 | 0.162 |             |
|                      | <b>Median</b> | 2.387 | 1.489 | 0.899 | 0.935 | 0.688 | 0.595 | 0.654 | 0.273 | 0.488 | 0.369 | 0.542 | 0.607 | 0.547 |             |
|                      | <b>Max</b>    | 3.888 | 3.215 | 1.299 | 6.128 | 1.285 | 0.808 | 1.483 | 1.126 | 1.522 | 4.530 | 0.909 | 2.939 | 0.661 |             |
| <b>Ethylbenzene</b>  | <b>Mean</b>   | 1.200 | 0.629 | 0.368 | 0.332 | 0.225 | 0.182 | 0.239 | 0.224 | 0.189 | 0.158 | 0.256 | 0.292 | 0.186 | 0.34        |
|                      | <b>SD</b>     | 0.341 | 0.256 | 0.096 | 0.132 | 0.053 | 0.042 | 0.157 | 0.173 | 0.067 | 0.057 | 0.075 | 0.073 | 0.026 |             |
|                      | <b>Median</b> | 1.203 | 0.626 | 0.364 | 0.336 | 0.245 | 0.190 | 0.189 | 0.134 | 0.203 | 0.163 | 0.233 | 0.274 | 0.186 |             |
|                      | <b>Max</b>    | 1.837 | 1.207 | 0.512 | 0.613 | 0.305 | 0.257 | 0.507 | 0.708 | 0.342 | 0.249 | 0.447 | 0.438 | 0.204 |             |
| <b>(m,p)-xylene</b>  | <b>Mean</b>   | 3.236 | 1.430 | 0.802 | 0.706 | 0.461 | 0.352 | 0.645 | 0.615 | 0.381 | 0.340 | 0.475 | 0.532 | 0.415 | 0.77        |
|                      | <b>SD</b>     | 1.007 | 0.527 | 0.187 | 0.288 | 0.123 | 0.095 | 0.475 | 0.479 | 0.125 | 0.193 | 0.151 | 0.171 | 0.000 |             |
|                      | <b>Median</b> | 3.059 | 1.393 | 0.781 | 0.713 | 0.492 | 0.368 | 0.416 | 0.380 | 0.418 | 0.322 | 0.467 | 0.498 | 0.415 |             |
|                      | <b>Max</b>    | 5.191 | 2.572 | 1.116 | 1.228 | 0.667 | 0.507 | 1.502 | 1.929 | 0.592 | 0.825 | 0.841 | 1.077 | 0.415 |             |
| <b>Styrene</b>       | <b>Mean</b>   | 2.128 | 1.781 | 1.068 | 0.798 | 0.556 | 0.437 | 0.488 | 0.541 | 0.520 | 0.501 | 0.737 | 0.712 | 0.850 | 0.83        |
|                      | <b>SD</b>     | 0.345 | 0.635 | 0.258 | 0.321 | 0.125 | 0.126 | 0.285 | 0.204 | 0.153 | 0.209 | 0.209 | 0.202 | 0.021 |             |
|                      | <b>Median</b> | 2.105 | 1.842 | 1.064 | 0.806 | 0.568 | 0.402 | 0.471 | 0.503 | 0.499 | 0.449 | 0.734 | 0.758 | 0.850 |             |
|                      | <b>Max</b>    | 2.735 | 2.965 | 1.713 | 1.487 | 0.717 | 0.651 | 1.065 | 1.159 | 0.767 | 0.937 | 1.060 | 1.065 | 0.865 |             |
| <b>o-xylene</b>      | <b>Mean</b>   | 1.256 | 0.545 | 0.303 | 0.308 | 0.215 | 0.150 | 0.244 | 0.235 | 0.158 | 0.131 | 0.177 | 0.210 | 0.157 | 0.30        |
|                      | <b>SD</b>     | 0.381 | 0.195 | 0.074 | 0.148 | 0.085 | 0.047 | 0.170 | 0.181 | 0.067 | 0.077 | 0.062 | 0.076 | 0.000 |             |
|                      | <b>Median</b> | 1.184 | 0.542 | 0.295 | 0.314 | 0.202 | 0.154 | 0.176 | 0.148 | 0.181 | 0.120 | 0.170 | 0.197 | 0.157 |             |
|                      | <b>Max</b>    | 1.980 | 0.965 | 0.435 | 0.717 | 0.351 | 0.224 | 0.591 | 0.729 | 0.245 | 0.310 | 0.334 | 0.458 | 0.157 |             |
| <b>Propylbenzene</b> | <b>Mean</b>   | 0.324 | 0.075 | 0.024 | 0.018 | 0.011 | 0.011 | 0.017 | 0.014 | 0.013 | 0.010 | 0.013 | 0.014 | 0.015 | 0.04        |
|                      | <b>SD</b>     | 0.107 | 0.031 | 0.008 | 0.007 | 0.004 | 0.005 | 0.010 | 0.011 | 0.004 | 0.005 | 0.005 | 0.005 | 0.002 |             |
|                      | <b>Median</b> | 0.279 | 0.081 | 0.023 | 0.019 | 0.010 | 0.012 | 0.015 | 0.010 | 0.015 | 0.010 | 0.012 | 0.014 | 0.015 |             |
|                      | <b>Max</b>    | 0.555 | 0.118 | 0.042 | 0.031 | 0.018 | 0.019 | 0.030 | 0.044 | 0.018 | 0.017 | 0.022 | 0.023 | 0.016 |             |
| <b>3-ET</b>          | <b>Mean</b>   | 0.988 | 0.246 | 0.073 | 0.052 | 0.031 | 0.031 | 0.049 | 0.038 | 0.027 | 0.022 | 0.028 | 0.030 | 0.030 | 0.11        |
|                      | <b>SD</b>     | 0.258 | 0.104 | 0.022 | 0.020 | 0.010 | 0.013 | 0.030 | 0.037 | 0.008 | 0.011 | 0.012 | 0.009 | 0.003 |             |
|                      | <b>Median</b> | 0.878 | 0.266 | 0.068 | 0.054 | 0.030 | 0.034 | 0.039 | 0.022 | 0.030 | 0.026 | 0.027 | 0.031 | 0.030 |             |
|                      | <b>Max</b>    | 1.565 | 0.389 | 0.126 | 0.086 | 0.051 | 0.053 | 0.090 | 0.132 | 0.037 | 0.036 | 0.050 | 0.046 | 0.033 |             |
| <b>4-ET</b>          | <b>Mean</b>   | 0.503 | 0.119 | 0.032 | 0.024 | 0.009 | 0.009 | 0.022 | 0.028 | 0.011 | 0.007 | 0.010 | 0.011 | 0.012 | 0.05        |
|                      | <b>SD</b>     | 0.138 | 0.055 | 0.013 | 0.011 | 0.005 | 0.005 | 0.020 | 0.029 | 0.004 | 0.004 | 0.005 | 0.004 | 0.002 |             |
|                      | <b>Median</b> | 0.434 | 0.128 | 0.029 | 0.024 | 0.008 | 0.010 | 0.012 | 0.011 | 0.013 | 0.008 | 0.010 | 0.012 | 0.012 |             |
|                      | <b>Max</b>    | 0.829 | 0.207 | 0.066 | 0.043 | 0.017 | 0.018 | 0.052 | 0.093 | 0.018 | 0.012 | 0.021 | 0.018 | 0.013 |             |
| <b>1,3,5-TMB</b>     | <b>Mean</b>   | 0.688 | 0.202 | 0.054 | 0.034 | 0.020 | 0.017 | 0.027 | 0.022 | 0.016 | 0.008 | 0.011 | 0.011 | 0.012 | 0.08        |
|                      | <b>SD</b>     | 0.134 | 0.088 | 0.017 | 0.013 | 0.006 | 0.006 | 0.016 | 0.016 | 0.005 | 0.004 | 0.005 | 0.004 | 0.001 |             |
|                      | <b>Median</b> | 0.636 | 0.231 | 0.048 | 0.034 | 0.020 | 0.019 | 0.021 | 0.016 | 0.018 | 0.010 | 0.010 | 0.012 | 0.012 |             |
|                      | <b>Max</b>    | 1.010 | 0.313 | 0.100 | 0.058 | 0.031 | 0.027 | 0.050 | 0.065 | 0.023 | 0.014 | 0.021 | 0.018 | 0.013 |             |
| <b>2-ET</b>          | <b>Mean</b>   | 0.901 | 0.249 | 0.060 | 0.033 | 0.020 | 0.017 | 0.032 | 0.027 | 0.015 | 0.012 | 0.014 | 0.014 | 0.015 | 0.10        |
|                      | <b>SD</b>     | 0.177 | 0.116 | 0.021 | 0.014 | 0.007 | 0.007 | 0.025 | 0.028 | 0.004 | 0.006 | 0.006 | 0.005 | 0.002 |             |
|                      | <b>Median</b> | 0.837 | 0.284 | 0.056 | 0.033 | 0.018 | 0.019 | 0.021 | 0.015 | 0.016 | 0.014 | 0.014 | 0.015 | 0.015 |             |
|                      | <b>Max</b>    | 1.349 | 0.398 | 0.115 | 0.062 | 0.035 | 0.028 | 0.072 | 0.100 | 0.020 | 0.019 | 0.024 | 0.022 | 0.016 |             |
| <b>1,2,4-TMB</b>     | <b>Mean</b>   | 2.556 | 0.827 | 0.207 | 0.118 | 0.072 | 0.066 | 0.100 | 0.086 | 0.057 | 0.043 | 0.050 | 0.053 | 0.060 | 0.30        |
|                      | <b>SD</b>     | 0.599 | 0.409 | 0.085 | 0.050 | 0.028 | 0.029 | 0.063 | 0.074 | 0.016 | 0.020 | 0.024 | 0.019 | 0.009 |             |
|                      | <b>Median</b> | 2.445 | 1.020 | 0.198 | 0.112 | 0.071 | 0.073 | 0.079 | 0.058 | 0.061 | 0.049 | 0.051 | 0.058 | 0.060 |             |
|                      | <b>Max</b>    | 3.971 | 1.348 | 0.435 | 0.232 | 0.128 | 0.108 | 0.195 | 0.274 | 0.078 | 0.071 | 0.095 | 0.084 | 0.067 |             |
| <b>1,2,3-TMB</b>     | <b>Mean</b>   | 1.227 | 0.471 | 0.129 | 0.064 | 0.044 | 0.033 | 0.041 | 0.039 | 0.025 | 0.016 | 0.022 | 0.026 | 0.054 | 0.15        |
|                      | <b>SD</b>     | 0.286 | 0.237 | 0.052 | 0.030 | 0.019 | 0.014 | 0.025 | 0.029 | 0.008 | 0.007 | 0.008 | 0.006 | 0.003 |             |
|                      | <b>Median</b> | 1.239 | 0.585 | 0.124 | 0.059 | 0.043 | 0.039 | 0.038 | 0.031 | 0.026 | 0.017 | 0.017 | 0.018 | 0.020 |             |
|                      | <b>Max</b>    | 1.810 | 0.773 | 0.258 | 0.136 | 0.080 | 0.051 | 0.077 | 0.113 | 0.034 | 0.026 | 0.031 | 0.026 | 0.022 |             |
| <b>Total</b>         | <b>Mean</b>   | 0.726 | 0.093 | 0.053 | 0.026 | 0.021 | 0.014 | 0.004 | 0.012 | 0.006 | 0.006 | 0.007 | 0.008 | 0.018 | 4.24 (66 %) |
|                      | <b>SD</b>     |       |       |       |       |       |       |       |       |       |       |       |       |       |             |
|                      | <b>Median</b> |       |       |       |       |       |       |       |       |       |       |       |       |       |             |
|                      | <b>Max</b>    |       |       |       |       |       |       |       |       |       |       |       |       |       |             |

Table A.2: Alkane concentrations for Welgegund

|                        |               | 2011  |       |       |       |       |       |       |       |       |       |       | 2012  |       | Annual mean |
|------------------------|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|
|                        |               | Febr  | March | April | May   | June  | July  | Aug   | Sept  | Oct   | Nov   | Dec   | Jan   | Febr  |             |
| <b>2,2,4-TMP</b>       | <b>Mean</b>   | 0.012 | 0.012 | 0.012 | 0.013 | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    | 0.01        |
|                        | <b>SD</b>     | 0.003 | 0.003 | 0.003 | 0.004 | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    |             |
|                        | <b>Median</b> | 0.012 | 0.012 | 0.015 | 0.015 | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    |             |
|                        | <b>Max</b>    | 0.015 | 0.015 | 0.015 | 0.015 | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    |             |
|                        | <b>Min</b>    | 0.007 | 0.007 | 0.007 | 0.006 | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    |             |
| <b>Heptane</b>         | <b>Mean</b>   | 0.523 | 0.338 | 0.272 | 0.187 | 0.147 | 0.121 | 0.169 | 0.214 | 0.211 | 0.110 | 0.211 | 0.232 | 0.275 | 0.22        |
|                        | <b>SD</b>     | 0.089 | 0.126 | 0.067 | 0.071 | 0.059 | 0.054 | 0.095 | 0.095 | 0.063 | 0.047 | 0.099 | 0.126 | 0.015 |             |
|                        | <b>Median</b> | 0.519 | 0.331 | 0.271 | 0.186 | 0.128 | 0.118 | 0.175 | 0.203 | 0.220 | 0.104 | 0.204 | 0.216 | 0.275 |             |
|                        | <b>Max</b>    | 0.713 | 0.572 | 0.395 | 0.328 | 0.251 | 0.226 | 0.369 | 0.464 | 0.302 | 0.179 | 0.373 | 0.446 | 0.286 |             |
|                        | <b>Min</b>    | 0.410 | 0.027 | 0.154 | 0.073 | 0.072 | 0.054 | 0.035 | 0.090 | 0.084 | 0.040 | 0.056 | 0.050 | 0.264 |             |
| <b>Hexane</b>          | <b>Mean</b>   | 0.060 | 0.098 | 0.049 | 0.044 | 0.071 | 0.073 | 0.056 | 0.071 | 0.146 | 0.038 | 0.043 | 0.043 | 0.037 | 0.07        |
|                        | <b>SD</b>     | 0.030 | 0.119 | 0.018 | 0.027 | 0.039 | 0.056 | 0.049 | 0.035 | 0.325 | 0.035 | 0.015 | 0.034 | 0.005 |             |
|                        | <b>Median</b> | 0.061 | 0.041 | 0.054 | 0.040 | 0.074 | 0.067 | 0.038 | 0.063 | 0.053 | 0.026 | 0.045 | 0.029 | 0.037 |             |
|                        | <b>Max</b>    | 0.128 | 0.455 | 0.074 | 0.110 | 0.166 | 0.219 | 0.185 | 0.151 | 1.405 | 0.142 | 0.070 | 0.138 | 0.040 |             |
|                        | <b>Min</b>    | 0.026 | 0.004 | 0.010 | 0.008 | 0.020 | 0.005 | 0.007 | 0.033 | 0.010 | 0.004 | 0.014 | 0.006 | 0.034 |             |
| <b>2-Methylpentane</b> | <b>Mean</b>   | 0.043 | 0.035 | 0.019 | 0.015 | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    | 0.03        |
|                        | <b>SD</b>     | 0.015 | 0.018 | 0.009 | 0.011 | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    |             |
|                        | <b>Median</b> | 0.049 | 0.035 | 0.018 | 0.015 | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    |             |
|                        | <b>Max</b>    | 0.065 | 0.068 | 0.040 | 0.043 | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    |             |
|                        | <b>Min</b>    | 0.019 | 0.003 | 0.005 | 0.003 | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    | ND    |             |
| <b>Octane</b>          | <b>Mean</b>   | 0.202 | 0.153 | 0.071 | 0.063 | 0.053 | 0.051 | 0.053 | 0.060 | 0.071 | 0.043 | 0.061 | 0.072 | 0.081 | 0.08        |
|                        | <b>SD</b>     | 0.036 | 0.082 | 0.014 | 0.025 | 0.022 | 0.027 | 0.030 | 0.022 | 0.025 | 0.017 | 0.021 | 0.025 | 0.006 |             |
|                        | <b>Median</b> | 0.192 | 0.139 | 0.069 | 0.061 | 0.053 | 0.053 | 0.057 | 0.064 | 0.074 | 0.044 | 0.059 | 0.077 | 0.081 |             |
|                        | <b>Max</b>    | 0.271 | 0.280 | 0.102 | 0.101 | 0.092 | 0.111 | 0.102 | 0.116 | 0.106 | 0.073 | 0.099 | 0.119 | 0.085 |             |
|                        | <b>Min</b>    | 0.164 | 0.028 | 0.052 | 0.016 | 0.023 | 0.011 | 0.006 | 0.026 | 0.014 | 0.014 | 0.021 | 0.030 | 0.077 |             |
| <b>Nonane</b>          | <b>Mean</b>   | ND    | ND    | 0.077 | 0.045 | 0.024 | 0.035 | 0.049 | 0.048 | 0.049 | 0.020 | 0.021 | 0.028 | 0.043 | 0.04        |
|                        | <b>SD</b>     | ND    | ND    | 0.026 | 0.018 | 0.012 | 0.024 | 0.035 | 0.033 | 0.026 | 0.010 | 0.012 | 0.016 | 0.006 |             |
|                        | <b>Median</b> | ND    | ND    | 0.075 | 0.045 | 0.023 | 0.035 | 0.039 | 0.041 | 0.042 | 0.024 | 0.019 | 0.030 | 0.043 |             |
|                        | <b>Max</b>    | ND    | ND    | 0.115 | 0.081 | 0.046 | 0.088 | 0.109 | 0.127 | 0.103 | 0.036 | 0.045 | 0.053 | 0.047 |             |
|                        | <b>Min</b>    | ND    | ND    | 0.037 | 0.014 | 0.008 | 0.007 | 0.005 | 0.015 | 0.017 | 0.006 | 0.006 | 0.007 | 0.039 |             |
| <b>Decane</b>          | <b>Mean</b>   | ND    | ND    | 0.591 | 0.261 | 0.124 | 0.123 | 0.155 | 0.236 | 0.208 | 0.085 | 0.079 | 0.077 | 0.097 | 0.19        |
|                        | <b>SD</b>     | ND    | ND    | 0.240 | 0.155 | 0.053 | 0.058 | 0.123 | 0.115 | 0.090 | 0.041 | 0.036 | 0.028 | 0.017 |             |
|                        | <b>Median</b> | ND    | ND    | 0.549 | 0.238 | 0.115 | 0.117 | 0.103 | 0.197 | 0.210 | 0.068 | 0.060 | 0.081 | 0.097 |             |
|                        | <b>Max</b>    | ND    | ND    | 1.117 | 0.647 | 0.273 | 0.221 | 0.429 | 0.459 | 0.373 | 0.162 | 0.145 | 0.138 | 0.109 |             |
|                        | <b>Min</b>    | ND    | ND    | 0.299 | 0.061 | 0.063 | 0.052 | 0.021 | 0.092 | 0.034 | 0.041 | 0.042 | 0.041 | 0.085 |             |
| <b>Total</b>           |               |       |       |       |       |       |       |       |       |       |       |       |       |       | 0.64 (10 %) |

Table A.3: Biogenic VOC concentrations for Welgegund

|                                    |               | 2011  |        |       |       |       |       |       |       |       |       | 2012  |       | Annual mean |       |
|------------------------------------|---------------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|-------|
|                                    |               | Febr  | March  | April | May   | June  | July  | Aug   | Sept  | Oct   | Nov   | Dec   | Jan   |             | Febr  |
| <b>isoprene</b>                    | <b>Mean</b>   | 0.039 | 0.023  | 0.011 | 0.020 | 0.042 | 0.007 | 0.025 | 0.026 | 0.051 | 0.029 | 0.054 | 0.028 | 0.028       | 0.029 |
|                                    | <b>SD</b>     | 0.036 | 0.021  | 0.018 | 0.022 | 0.115 | 0.006 | 0.032 | 0.023 | 0.056 | 0.023 | 0.041 | 0.048 | 0.031       |       |
|                                    | <b>Median</b> | 0.020 | 0.015  | 0.003 | 0.009 | 0.010 | 0.006 | 0.012 | 0.014 | 0.028 | 0.026 | 0.046 | 0.007 | 0.028       |       |
|                                    | <b>Max</b>    | 0.116 | 0.081  | 0.078 | 0.087 | 0.442 | 0.022 | 0.098 | 0.091 | 0.202 | 0.079 | 0.160 | 0.166 | 0.050       |       |
|                                    | <b>Min</b>    | 0.005 | 0.004  | 0.002 | 0.002 | 0.003 | 0.002 | 0.002 | 0.005 | 0.002 | 0.002 | 0.008 | 0.002 | 0.006       |       |
| <b>MBO</b>                         | <b>Mean</b>   | 0.042 | 0.097  | 0.014 | 0.006 | 0.002 | 0.002 | 0.003 | 0.003 | 0.006 | 0.007 | 0.014 | 0.012 | 0.021       | 0.016 |
|                                    | <b>SD</b>     | 0.013 | 0.281  | 0.005 | 0.006 | 0.001 | 0.000 | 0.003 | 0.001 | 0.003 | 0.006 | 0.010 | 0.006 | 0.002       |       |
|                                    | <b>Median</b> | 0.042 | 0.029  | 0.014 | 0.004 | 0.002 | 0.002 | 0.002 | 0.002 | 0.006 | 0.004 | 0.011 | 0.013 | 0.021       |       |
|                                    | <b>Max</b>    | 0.061 | 1.149  | 0.024 | 0.023 | 0.007 | 0.003 | 0.013 | 0.007 | 0.013 | 0.025 | 0.043 | 0.023 | 0.023       |       |
|                                    | <b>Min</b>    | 0.017 | 0.004  | 0.007 | 0.001 | 0.001 | 0.001 | 0.001 | 0.002 | 0.001 | 0.001 | 0.005 | 0.002 | 0.020       |       |
| <b><math>\alpha</math>-pinene</b>  | <b>Mean</b>   | 0.306 | 5.106  | 0.110 | 0.074 | 0.052 | 0.032 | 0.032 | 0.032 | 0.032 | 0.025 | 0.035 | 0.030 | 0.040       | 0.468 |
|                                    | <b>SD</b>     | 0.040 | 19.717 | 0.027 | 0.035 | 0.022 | 0.008 | 0.018 | 0.016 | 0.011 | 0.017 | 0.018 | 0.009 | 0.001       |       |
|                                    | <b>Median</b> | 0.302 | 0.187  | 0.110 | 0.070 | 0.050 | 0.033 | 0.033 | 0.030 | 0.029 | 0.024 | 0.030 | 0.030 | 0.040       |       |
|                                    | <b>Max</b>    | 0.386 | 79.043 | 0.165 | 0.157 | 0.102 | 0.049 | 0.072 | 0.081 | 0.052 | 0.074 | 0.096 | 0.045 | 0.041       |       |
|                                    | <b>Min</b>    | 0.245 | 0.036  | 0.064 | 0.023 | 0.027 | 0.016 | 0.003 | 0.012 | 0.005 | 0.007 | 0.008 | 0.012 | 0.039       |       |
| <b>camphene</b>                    | <b>Mean</b>   | 0.021 | 0.123  | 0.010 | 0.007 | 0.004 | 0.015 | 0.006 | 0.004 | 0.003 | 0.002 | 0.002 | 0.003 | 0.004       | 0.016 |
|                                    | <b>SD</b>     | 0.010 | 0.435  | 0.005 | 0.004 | 0.004 | 0.037 | 0.007 | 0.003 | 0.002 | 0.001 | 0.001 | 0.001 | 0.001       |       |
|                                    | <b>Median</b> | 0.018 | 0.013  | 0.009 | 0.007 | 0.002 | 0.003 | 0.004 | 0.003 | 0.003 | 0.002 | 0.002 | 0.003 | 0.004       |       |
|                                    | <b>Max</b>    | 0.049 | 1.753  | 0.021 | 0.016 | 0.013 | 0.156 | 0.028 | 0.011 | 0.006 | 0.005 | 0.005 | 0.005 | 0.005       |       |
|                                    | <b>Min</b>    | 0.011 | 0.002  | 0.002 | 0.002 | 0.001 | 0.001 | 0.002 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.003       |       |
| <b><math>\beta</math>-pinene</b>   | <b>Mean</b>   | 0.094 | 0.877  | 0.025 | 0.014 | 0.009 | 0.008 | 0.007 | 0.006 | 0.010 | 0.004 | 0.006 | 0.005 | 0.009       | 0.084 |
|                                    | <b>SD</b>     | 0.025 | 3.270  | 0.007 | 0.008 | 0.004 | 0.004 | 0.005 | 0.003 | 0.005 | 0.003 | 0.004 | 0.002 | 0.000       |       |
|                                    | <b>Median</b> | 0.095 | 0.055  | 0.023 | 0.013 | 0.009 | 0.008 | 0.006 | 0.005 | 0.011 | 0.003 | 0.006 | 0.005 | 0.009       |       |
|                                    | <b>Max</b>    | 0.135 | 13.137 | 0.036 | 0.030 | 0.017 | 0.016 | 0.022 | 0.014 | 0.018 | 0.011 | 0.018 | 0.010 | 0.009       |       |
|                                    | <b>Min</b>    | 0.053 | 0.008  | 0.013 | 0.003 | 0.003 | 0.002 | 0.001 | 0.003 | 0.002 | 0.001 | 0.002 | 0.003 | 0.009       |       |
| <b>3<math>\Delta</math>-carene</b> | <b>Mean</b>   | 0.020 | 5.608  | 0.005 | 0.004 | 0.003 | 0.003 | 0.002 | 0.002 | 0.003 | 0.005 | 0.005 | 0.002 | 0.001       | 0.455 |
|                                    | <b>SD</b>     | 0.004 | 22.363 | 0.002 | 0.002 | 0.004 | 0.001 | 0.001 | 0.001 | 0.001 | 0.009 | 0.013 | 0.001 | 0.000       |       |
|                                    | <b>Median</b> | 0.019 | 0.014  | 0.005 | 0.004 | 0.002 | 0.003 | 0.002 | 0.002 | 0.003 | 0.003 | 0.003 | 0.001 | 0.001       |       |
|                                    | <b>Max</b>    | 0.027 | 89.470 | 0.009 | 0.011 | 0.016 | 0.003 | 0.003 | 0.003 | 0.005 | 0.039 | 0.055 | 0.003 | 0.001       |       |
|                                    | <b>Min</b>    | 0.014 | 0.001  | 0.002 | 0.002 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001       |       |
| <b><math>\rho</math>-cymene</b>    | <b>Mean</b>   | 0.330 | 0.926  | 0.047 | 0.029 | 0.017 | 0.012 | 0.018 | 0.018 | 0.016 | 0.015 | 0.015 | 0.014 | 0.028       | 0.112 |
|                                    | <b>SD</b>     | 0.075 | 3.181  | 0.021 | 0.014 | 0.009 | 0.006 | 0.010 | 0.011 | 0.005 | 0.009 | 0.010 | 0.008 | 0.007       |       |
|                                    | <b>Median</b> | 0.339 | 0.161  | 0.048 | 0.029 | 0.015 | 0.015 | 0.019 | 0.016 | 0.016 | 0.016 | 0.014 | 0.015 | 0.028       |       |
|                                    | <b>Max</b>    | 0.493 | 12.852 | 0.080 | 0.056 | 0.037 | 0.021 | 0.032 | 0.044 | 0.026 | 0.032 | 0.033 | 0.027 | 0.033       |       |
|                                    | <b>Min</b>    | 0.195 | 0.023  | 0.016 | 0.011 | 0.005 | 0.003 | 0.001 | 0.005 | 0.006 | 0.003 | 0.004 | 0.005 | 0.024       |       |
| <b>1,8-cineol</b>                  | <b>Mean</b>   | 0.095 | 0.321  | 0.005 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.006 | 0.002 | 0.003 | 0.002 | 0.004       | 0.034 |
|                                    | <b>SD</b>     | 0.038 | 1.144  | 0.003 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.002 | 0.001 | 0.001 | 0.001 | 0.003       |       |
|                                    | <b>Median</b> | 0.108 | 0.039  | 0.004 | 0.002 | 0.003 | 0.002 | 0.003 | 0.002 | 0.006 | 0.003 | 0.003 | 0.002 | 0.004       |       |
|                                    | <b>Max</b>    | 0.139 | 4.611  | 0.010 | 0.007 | 0.003 | 0.004 | 0.005 | 0.005 | 0.011 | 0.006 | 0.007 | 0.004 | 0.006       |       |
|                                    | <b>Min</b>    | 0.033 | 0.002  | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.002       |       |
| <b>limonene</b>                    | <b>Mean</b>   | 0.083 | 2.455  | 0.050 | 0.040 | 0.016 | 0.008 | 0.029 | 0.020 | 0.032 | 0.021 | 0.010 | 0.014 | 0.030       | 0.223 |
|                                    | <b>SD</b>     | 0.030 | 9.621  | 0.048 | 0.020 | 0.015 | 0.004 | 0.023 | 0.014 | 0.013 | 0.011 | 0.009 | 0.013 | 0.001       |       |
|                                    | <b>Median</b> | 0.084 | 0.053  | 0.030 | 0.039 | 0.010 | 0.007 | 0.017 | 0.016 | 0.031 | 0.020 | 0.007 | 0.009 | 0.030       |       |
|                                    | <b>Max</b>    | 0.152 | 38.534 | 0.148 | 0.071 | 0.059 | 0.016 | 0.075 | 0.047 | 0.062 | 0.049 | 0.039 | 0.047 | 0.031       |       |
|                                    | <b>Min</b>    | 0.045 | 0.015  | 0.007 | 0.009 | 0.005 | 0.003 | 0.004 | 0.003 | 0.007 | 0.006 | 0.002 | 0.002 | 0.030       |       |
| <b>terpinolene</b>                 | <b>Mean</b>   | 0.064 | 0.587  | 0.008 | 0.005 | 0.003 | 0.004 | 0.003 | 0.003 | 0.007 | 0.003 | 0.003 | 0.004 | 0.002       | 0.055 |
|                                    | <b>SD</b>     | 0.020 | 2.188  | 0.004 | 0.002 | 0.001 | 0.003 | 0.001 | 0.001 | 0.005 | 0.000 | 0.000 | 0.002 | 0.000       |       |
|                                    | <b>Median</b> | 0.060 | 0.040  | 0.008 | 0.005 | 0.002 | 0.002 | 0.003 | 0.003 | 0.005 | 0.003 | 0.003 | 0.003 | 0.002       |       |
|                                    | <b>Max</b>    | 0.101 | 8.790  | 0.017 | 0.011 | 0.004 | 0.011 | 0.006 | 0.004 | 0.015 | 0.003 | 0.003 | 0.009 | 0.002       |       |
|                                    | <b>Min</b>    | 0.038 | 0.010  | 0.003 | 0.002 | 0.002 | 0.001 | 0.001 | 0.001 | 0.002 | 0.003 | 0.003 | 0.002 | 0.001       |       |
| <b>AMCH</b>                        | <b>Mean</b>   | 0.012 | 0.060  | 0.002 | 0.002 | 0.002 | 0.003 | 0.002 | 0.002 | 0.002 | 0.003 | 0.003 | 0.003 | 0.003       | 0.008 |
|                                    | <b>SD</b>     | 0.005 | 0.209  | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000       |       |
|                                    | <b>Median</b> | 0.014 | 0.009  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003       |       |
|                                    | <b>Max</b>    | 0.018 | 0.843  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003       |       |
|                                    | <b>Min</b>    | 0.004 | 0.002  | 0.002 | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.001 | 0.003 | 0.003 | 0.003 | 0.003       |       |

Table A.3: Continued from previous page. Biogenic VOC concentrations for Welgegend

|                        |               |       |        |       |       |       |       |       |       |       |       |       |       |             |       |       |
|------------------------|---------------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|-------|-------|
| <b>nopinone</b>        | <b>Mean</b>   | 0.003 | 0.003  | 0.008 | 0.006 | 0.004 | 0.005 | 0.004 | 0.006 | 0.017 | 0.008 | 0.006 | 0.007 | 0.009       | 0.007 |       |
|                        | <b>SD</b>     | 0.000 | 0.000  | 0.005 | 0.003 | 0.002 | 0.003 | 0.002 | 0.002 | 0.011 | 0.004 | 0.002 | 0.004 | 0.001       |       |       |
|                        | <b>Median</b> | 0.003 | 0.003  | 0.008 | 0.005 | 0.004 | 0.004 | 0.004 | 0.004 | 0.006 | 0.011 | 0.006 | 0.005 | 0.006       |       | 0.009 |
|                        | <b>Max</b>    | 0.003 | 0.003  | 0.020 | 0.012 | 0.010 | 0.011 | 0.009 | 0.009 | 0.009 | 0.044 | 0.019 | 0.010 | 0.017       |       | 0.010 |
|                        | <b>Min</b>    | 0.003 | 0.003  | 0.003 | 0.001 | 0.002 | 0.002 | 0.001 | 0.004 | 0.002 | 0.002 | 0.003 | 0.004 | 0.003       |       | 0.008 |
| <b>bornylacetate</b>   | <b>Mean</b>   | 0.002 | 0.003  | 0.002 | 0.002 | 0.003 | 0.002 | 0.002 | 0.002 | 0.002 | 0.003 | 0.002 | 0.003 | 0.003       | 0.002 |       |
|                        | <b>SD</b>     | 0.001 | 0.002  | 0.001 | 0.001 | 0.000 | 0.001 | 0.001 | 0.000 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000       |       |       |
|                        | <b>Median</b> | 0.001 | 0.003  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003       |       |       |
|                        | <b>Max</b>    | 0.003 | 0.010  | 0.003 | 0.003 | 0.003 | 0.004 | 0.003 | 0.003 | 0.003 | 0.003 | 0.006 | 0.003 | 0.003       |       |       |
|                        | <b>Min</b>    | 0.001 | 0.001  | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.003 | 0.002 | 0.003       |       |       |
| <b>longicyclene</b>    | <b>Mean</b>   | 0.020 | 0.012  | 0.003 | 0.002 | 0.002 | 0.003 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.001 | 0.002       | 0.004 |       |
|                        | <b>SD</b>     | 0.017 | 0.012  | 0.002 | 0.002 | 0.001 | 0.002 | 0.001 | 0.001 | 0.002 | 0.001 | 0.001 | 0.001 | 0.001       |       |       |
|                        | <b>Median</b> | 0.013 | 0.009  | 0.002 | 0.002 | 0.001 | 0.003 | 0.001 | 0.003 | 0.001 | 0.003 | 0.002 | 0.001 | 0.002       |       |       |
|                        | <b>Max</b>    | 0.067 | 0.045  | 0.009 | 0.008 | 0.005 | 0.007 | 0.003 | 0.003 | 0.007 | 0.004 | 0.003 | 0.003 | 0.003       |       |       |
|                        | <b>Min</b>    | 0.007 | 0.001  | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001       |       |       |
| <b>iso-longifolene</b> | <b>Mean</b>   | 0.006 | 0.004  | 0.002 | 0.002 | 0.002 | 0.002 | 0.003 | 0.003 | 0.002 | 0.003 | 0.003 | 0.003 | 0.003       | 0.003 |       |
|                        | <b>SD</b>     | 0.004 | 0.004  | 0.001 | 0.001 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000       |       |       |
|                        | <b>Median</b> | 0.004 | 0.002  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003       |       |       |
|                        | <b>Max</b>    | 0.017 | 0.016  | 0.003 | 0.004 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003       |       |       |
|                        | <b>Min</b>    | 0.003 | 0.001  | 0.001 | 0.001 | 0.001 | 0.001 | 0.003 | 0.003 | 0.001 | 0.003 | 0.003 | 0.003 | 0.003       |       |       |
| <b>β-caryophyllene</b> | <b>Mean</b>   | 0.041 | 0.065  | 0.015 | 0.012 | 0.008 | 0.019 | 0.010 | ND    | ND    | ND    | ND    | 0.008 | 0.006       | 0.022 |       |
|                        | <b>SD</b>     | 0.027 | 0.099  | 0.008 | 0.006 | 0.003 | 0.014 | 0.007 | ND    | ND    | ND    | ND    | 0.004 | 0.000       |       |       |
|                        | <b>Median</b> | 0.029 | 0.032  | 0.013 | 0.011 | 0.007 | 0.012 | 0.008 | ND    | ND    | ND    | ND    | 0.007 | 0.006       |       |       |
|                        | <b>Max</b>    | 0.104 | 0.413  | 0.036 | 0.021 | 0.014 | 0.044 | 0.023 | 0.000 | 0.000 | 0.000 | 0.000 | 0.017 | 0.006       |       |       |
|                        | <b>Min</b>    | 0.021 | 0.007  | 0.008 | 0.002 | 0.004 | 0.004 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.004 | 0.005       |       |       |
| <b>aromadendrene</b>   | <b>Mean</b>   | 0.003 | 0.003  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.002 | 0.002 | 0.003       | 0.002 |       |
|                        | <b>SD</b>     | 0.000 | 0.000  | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000       |       |       |
|                        | <b>Median</b> | 0.003 | 0.003  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003       |       |       |
|                        | <b>Max</b>    | 0.003 | 0.003  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003       |       |       |
|                        | <b>Min</b>    | 0.003 | 0.003  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.001 | 0.001       |       |       |
| <b>α-humulene</b>      | <b>Mean</b>   | 0.003 | 0.004  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.002 | 0.002 | 0.003       | 0.003 |       |
|                        | <b>SD</b>     | 0.000 | 0.005  | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000       |       |       |
|                        | <b>Median</b> | 0.003 | 0.003  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003       |       |       |
|                        | <b>Max</b>    | 0.003 | 0.022  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003       |       |       |
|                        | <b>Min</b>    | 0.003 | 0.003  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.001 | 0.001       |       |       |
| <b>farnesene</b>       | <b>Mean</b>   | 0.003 | 0.005  | 0.002 | 0.003 | 0.003 | 0.002 | 0.003 | 0.003 | 0.003 | 0.003 | 0.002 | 0.002 | 0.003       | 0.003 |       |
|                        | <b>SD</b>     | 0.001 | 0.006  | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000       |       |       |
|                        | <b>Median</b> | 0.003 | 0.002  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003       |       |       |
|                        | <b>Max</b>    | 0.007 | 0.021  | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003       |       |       |
|                        | <b>Min</b>    | 0.002 | 0.001  | 0.001 | 0.003 | 0.003 | 0.001 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.001 | 0.001       |       |       |
| <b>4-Allylanisole</b>  | <b>Mean</b>   | 0.022 | 0.033  | 0.012 | 0.008 | 0.006 | 0.006 | 0.005 | ND    | ND    | ND    | ND    | 0.007 | 0.005       | 0.012 |       |
|                        | <b>SD</b>     | 0.014 | 0.042  | 0.007 | 0.006 | 0.003 | 0.004 | 0.003 | ND    | ND    | ND    | ND    | 0.003 | 0.002       |       |       |
|                        | <b>Median</b> | 0.020 | 0.020  | 0.011 | 0.007 | 0.006 | 0.005 | 0.005 | ND    | ND    | ND    | ND    | 0.007 | 0.005       |       |       |
|                        | <b>Max</b>    | 0.047 | 0.179  | 0.029 | 0.021 | 0.013 | 0.014 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 | 0.011 | 0.006       |       |       |
|                        | <b>Min</b>    | 0.006 | 0.004  | 0.005 | 0.001 | 0.001 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 0.004       |       |       |
| <b>monoterpenes</b>    | <b>Mean</b>   | 0.131 | 2.240  | 0.036 | 0.025 | 0.015 | 0.012 | 0.014 | 0.012 | 0.015 | 0.011 | 0.011 | 0.010 | 0.016       | 0.202 |       |
|                        | <b>SD</b>     | 0.019 | 8.682  | 0.011 | 0.010 | 0.006 | 0.007 | 0.005 | 0.006 | 0.004 | 0.006 | 0.007 | 0.004 | 0.001       |       |       |
|                        | <b>Median</b> | 0.127 | 0.075  | 0.033 | 0.024 | 0.014 | 0.011 | 0.015 | 0.010 | 0.016 | 0.009 | 0.010 | 0.010 | 0.016       |       |       |
|                        | <b>Max</b>    | 0.173 | 34.797 | 0.059 | 0.045 | 0.026 | 0.038 | 0.021 | 0.028 | 0.020 | 0.030 | 0.036 | 0.019 | 0.017       |       |       |
|                        | <b>Min</b>    | 0.101 | 0.014  | 0.021 | 0.007 | 0.007 | 0.005 | 0.006 | 0.005 | 0.004 | 0.004 | 0.003 | 0.004 | 0.016       |       |       |
| <b>sesquiterpenes</b>  | <b>Mean</b>   | 0.013 | 0.016  | 0.005 | 0.004 | 0.003 | 0.005 | 0.003 | 0.002 | 0.002 | 0.002 | 0.002 | 0.003 | 0.003       | 0.006 |       |
|                        | <b>SD</b>     | 0.008 | 0.021  | 0.001 | 0.001 | 0.001 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000       |       |       |
|                        | <b>Median</b> | 0.009 | 0.008  | 0.004 | 0.004 | 0.003 | 0.004 | 0.003 | 0.002 | 0.002 | 0.002 | 0.002 | 0.003 | 0.003       |       |       |
|                        | <b>Max</b>    | 0.033 | 0.087  | 0.009 | 0.007 | 0.005 | 0.009 | 0.006 | 0.002 | 0.003 | 0.002 | 0.002 | 0.005 | 0.003       |       |       |
|                        | <b>Min</b>    | 0.007 | 0.003  | 0.003 | 0.002 | 0.003 | 0.003 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.001 | 0.002       |       |       |
| <b>Total</b>           |               |       |        |       |       |       |       |       |       |       |       |       |       | 1.56 (24 %) |       |       |