VisualAge: A novel approach to U-Pb LA-ICP-MS geochronology

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This contribution presents VisualAge, a new tool for reducing and visualizing U-Pb geochronology data obtained by LA-ICP-MS. VisualAge was developed as an add-on for Iolite (the freely available ICP-MS data analysis tool [1]) and consists of two main components: an Iolite data reduction scheme (DRS) and Igor Pro visualization routines. The VisualAge DRS improves upon the existing Iolite U-Pb geochronology DRS by calculating the $^{207}Pb/^{206}Pb$ age as well as the common lead corrected ratios and ages (either via the measured ^{204}Pb signal or where ^{204}Pb is unavailable, with Andersen's approach [2]) for each point of the raw ICP-MS data. By far the most important feature of VisualAge is its ability to display a 'live' concordia diagram. This feature allows one to visualize the data of an Iolite integration on a concordia diagram as it is being selected and adjusted, thus providing immediate visual feedback regarding data discordance, uncertainty, and common lead contamination for different regions of the ICP-MS signal. The 'live' concordia diagram is particularly useful for LA-ICP-MS zircon data, where the signal from a single grain can consist of zones of concordance, disturbed or metamict areas, as well as inherited cores or younger overgrowths. Once integrations have been selected in Iolite, VisualAge can also be used to quickly construct age histograms and probability distributions, standard and Tera-Wasserburg style concordia diagrams (including the computation of a concordia age [3]), as well as 3D U-Th-Pb and total U-Pb concordia diagrams.

[1] Hellstrom *et al*. (2008) *Mineral. Assoc. Can. Short Course Ser*. **40**, 135–145. [2] Andersen (2002) *Chem. Geol*. **192**, 59–79. [3] Ludwig (1998) *Geochim. Cosmochim. Acta* **62**, 665–676.

Cloud droplet activation of organic aerosols: The role of molecule size, polarity, and functional group composition

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Secondary organic aerosols (SOA) comprise a significant fraction of the atmospheric aerosol burden and play an important role in direct and indirect aerosol effects on climate. To model SOA-cloud interactions we ultimately seek relationships that can predict a compound's contribution to a particle's ability to serve as a cloud condensation nucleus (CCN) based on its chemical composition. The relative CCN efficiency of a compound is described by the hygroscopicity parameter κ. We find that for sufficiently functionalized molecules, κ can be modeled within a factor two using predictions based on molar volume. Compounds with fewer functional groups strongly deviate from this model, resulting in a continuum of reduced κ values between the molar volume model and zero. We use experimentally determined derivatives of d (κ)/d (number of functional groups of type i) to quantify this effect and to develop a framework that can be used to compute κ based on the molar volume, number of carbon atoms, and the number and type of functional groups present in the molecule.

Ambient organic aerosols consist of a large number of different compounds. We developed a new technique to characterize this distribution by collecting aerosol on filters, extracting the compounds into solvent, separating the extract using high pressure liquid chromatography, and measuring the κ value of each seperated component as a function of column retention time using scanning flow CCN analysis. Kappa generally decreased with retention time, suggesting a relationship between a compound's polarity and its κ value. The frequency distributions of component κ's that make up the mixture provide detailed information linking chemical mechanisms of SOA formation and organic aerosol CCN activity.