

**Persistence of mantle lithospheric
Re-Os signature during
lithosphere-asthenosphere
interaction: Insights from *in situ*
isotopic analysis of sulfides from the
Ronda peridotite (S. Spain)**

CLAUDIO MARCHESI^{1*}, WILLIAM L. GRIFFIN²,
CARLOS J. GARRIDO³, JEAN-LOUIS BODINIER¹,
SUZANNE Y. O'REILLY² AND NORMAN J. PEARSON²

¹Géosciences Montpellier, Montpellier, France

(*correspondence: claudio.marchesi@gm.univ-montp2.fr)

(Jean-Louis.Bodinier@gm.univ-montp2.fr)

²GEMOC ARC National Key Centre, Sydney, Australia

(wgriffin@els.mq.edu.au, soreilly@els.mq.edu.au,

npearson@els.mq.edu.au)

³Instituto Andaluz de Ciencias de la Tierra, Granada, Spain

(carlosg@ugr.es)

The Ronda peridotite massif (S. Spain) mainly consists of highly foliated spinel-peridotite tectonites and undeformed granular peridotites that are separated by a recrystallization front. The spinel tectonites are interpreted as vestiges of ancient subcontinental lithospheric mantle and the granular peridotites as a portion of lithospheric mantle that underwent partial melting and pervasive percolation of basaltic melts induced by Cenozoic asthenospheric upwelling. The Re-Os isotopic signature of sulfides from the granular domain and the recrystallization front mostly coincides with that of grains in the spinel tectonites. This indicates that the Re-Os radiometric system was highly resistant to partial melting and melt percolation induced by Cenozoic lithospheric thermal erosion. The Re-Os isotopic systematics of sulfides in the Ronda peridotites thus mostly conserves the memory of ancient magmatic events in the lithospheric mantle. Os model ages record two melting episodes at ~ 1.6-1.8 Ga and 1.2-1.4 Ga, respectively. A new generation of sulfides precipitated in peridotites at ~ 0.7-0.9 Ga. These different Proterozoic Os model ages are consistent with similar results obtained for several mantle suites in central/western Europe and northern Africa as well as with Nd model ages inferred for the continental crust of these regions. This suggests that the events recorded in mantle sulfides of the Ronda peridotites reflect different stages of generation of the continental crust in the ancient Gondwana supercontinent.

Organic aerosols: Liquids or glasses?

C. MARCOLLI^{1*}, B. ZOBRIST^{1,2}, U.K. KRIEGER¹,
B.P. LUO¹, V. SOONSIN¹, T. PETER¹,
D.A. PEDERNA² AND T. KOOP²

¹ETH Zurich, Institute for Atmospheric and Climate Science,
Zurich, Switzerland

(*correspondence: claudia.marcolli @env.ethz.ch)

²Department of Chemistry, Bielefeld University, Germany

Depending on their concentration and composition, aerosols affect various atmospheric properties and processes, such as atmospheric chemistry and Earth's radiative budget. There are several factors which determine the physical state of an aerosol: chemical composition and mixing state of its constituents, temperature and ambient relative humidity (RH). The atmospheric aerosol itself is a complex mixture of various inorganic and organic components, whereas the organic fraction can represent more than 50% of the total aerosol mass. The organic aerosol fraction is expected to be present in a liquid or glassy state even at low relative humidity (RH), because the very large number of organic compounds depresses the temperature at which crystalline solids form [1, 2]. Whether aerosol particles are present as liquids or as glasses may influence their properties, e.g. water uptake, aerosol chemistry, as well as ice nucleation and ice crystal growth.

We investigated the glass transition temperatures (T_g) of a series of aqueous organic solutions such as polyols, sugars and dicarboxylic acids as a function of the solute concentration using a differential scanning calorimeter (DSC) [2]. These measurements show that the higher the molar mass of the organic solutes, the higher T_g of their respective solutions at a given water activity. Aerosol particles containing larger (≥ 150 g mol⁻¹) organic molecules are therefore likely to form glasses in the upper troposphere. Moreover, we performed hygroscopicity cycles of single levitated sucrose particles at different temperatures using an electrodynamic balance (EDB). The hygroscopicity cycles performed at 291 K for example showed for crystalline sucrose water uptake at roughly 85% RH due to deliquescence whereas glassy particles started to take up water already at ~40-45% RH and turned fully liquid above 55%. The corresponding T_g inferred from DSC experiments is expected at 30% RH. This shows that a glass-to-liquid transition occurs by increasing RH, but that water uptake is delayed above the T_g obtained in DSC experiments. We therefore conclude that water uptake by organic aerosol particles at temperatures important for cirrus clouds formation is significantly impeded.

[1] Marcolli *et al.* (2004) *J. Phys. Chem.* **108**, 2216-2224.

[2] Zobrist *et al.* (2008) *Atmos. Chem. Phys.* **8**, 5221-5244.