Garnet, zircon and monazite as monitors of high-temperature metamorphic events: How useful are they?

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Value adding to the temporal information retrieved from the analysis of geochronometers, such as zircon and monazite, through the collection of rare-earth (REE) and trace element datasets and attempts to integrate their growth with thermodynamic datasets is a field that is rapidly evolving. This information when coupled with REE analyses of silicate minerals such as garnet, orthopyroxene and feldspar allows inferences to be made about the rates of heating, cooling and exhumation as well as the timing of partial melting experienced by rocks during orogenic cycles. Advances in anlytical capabilities (e.g. laser split streaming) now allow large datasets to be collected across entire terranes enabling age-mapping of orogens to be undertaken. However, in high-temperature metapelites that seem to have all the right ingredients for these processes to be constrained (e.g. they contain garnet, zircon, monazite and rutile, they've melted and experienced temperatures in excess of 900 °C) variations in the REE partitioning between zircon and garnet varies over the length-scale of a single thin section. This presentation seeks to highlight some complexities in the application of these undoublty useful techniques to high-temperature metamorphic rocks from a number of terranes and hopefully provide some useful comments on developing more effiecnet strategies to characterise the *P–T–t* evolution of high-grade terranes.

Combustion aerosol over marine stratus: Long range transport, subsidence and aerosol-cloud interactions over the South East Pacific

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The worlds largest stratus deck over the South East Pacific (SEP) was a study target for the VOCALS (http://www.eol.ucar.edu/projects/vocals/) experiment in October 2008. Aerosol-cloud interactions were one major goal of the 14 flights of the NCAR C-130 aircraft reported here. Each flight covered about a 1000 km range with multiple profiles and legs below, in and above the Sc deck.

Strong aerosol sources along the coast of Chile were expected and found to influence cloud condensation nuclei (CCN) in coastal clouds. However; "rivers" of elevated CO, black carbon (BC) associated with combustion aerosol effective as CCN at <0.3%S were also common in subsiding FT. These often lay above the extensive Sc deck for over 1000km offshore and included aerosol from sources over the western Pacific as well as South America. When present above cloud, this combustion aerosol increased available CCN and decreased effective radius compared to clouds in "clean" MBL air advected from the South Pacific. Observed aerosol entrainment appeared linked to turbulence localized near cloud that significantly exceeded mean estimated entrainment rates. Surface derived sea-spray aerosol (Dp>40nm) only accounted for about 20% of MBL CCN.

Pockets of Open Cell (POC) convection were consistently found in air with CO values lower than adjacent cloudy regions and similar to values over the remote South Pacific. As CO is not depleted by clouds or precipitation this suggests POC's are favored to form in clean SP air not impacted by entrained combustion aerosol. Preliminary LES model results indicate that such entrainment may help buffer MBL clouds against depletion of CCN by drizzle. The latter would delay transition of closed cell to open cell convection, potentially leading to increased lifetimes of Sc clouds. One case of entrainment of a strong "river" of pollution appears to have led to a transition from POC's back to a cloudy MBL.

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