Exploiting SCIAMACHY's capabilities for aerosol retrieval from satellite

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Aerosol Retrieval

Aerosol particles are very diverse. This makes them very complicated, from a remote sensing point of view, because – unlike trace gases – aerosols usually do not have characteristic absorption features in the wavelength range covered by instruments used for atmospheric measurements. For aerosol retrieval from satellite instruments, two more complications arise: varying surface reflection and variable cloud cover.

We attack the aerosol retrieval problem simultaneously from several sides, taking full advantage of the range of possibilities that satellite instruments with moderate spectral resolution (e.g. SCIAMACHY and the GOME instruments) offer. First, we calculate the UV Aerosol Index (UVAI) from radiances in the UV range. The UVAI is a semi-quantitative indicator for aerosols, with the advantages that it is very sensitive to aerosols, not very sensitive to surface type, and that it can be calculated for clear as well as for cloudy scenes. Next, the radiances at several wavelengths in the visible range are studied, as well as the absorption bands of O_2 and $(O_2)_2$. These three quantities, combined with information from the Ring effect (Raman scattering), will aid us in determining aerosol optical parameters, as well as aerosol layer altitude, in more detail. The obtained aerosol parameters will in the near future be used to calculate aerosol radiative effects on a global scale.

Several case studies will be shown where the different measurements – UVAI, radiances, absorption features, and Ring effect – are combined with radiative transfer modeling to obtain information on aerosol characteristics.

Lithium as a tracer of fluids in subduction zones: The Franciscan Complex, CA

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One impact of fluids in subduction zones is the transport of material from the subducting slab into the overlying mantle wedge. Some mélange zones likely represent heterogeneous regions above the subducting slab through which fluids can pass. Analysis at the mineral and block scale of material from these mélanges has the potential to elucidate mechanisms and pathways through which fluid is channeled upwards and towards the mantle wedge. Lithium has received much attention recently as a potential tracer of fluid rock interactions in subduction zones. The purpose of this study is to develop a better understanding of the behavior of Li in subduction zones by examining the distribution of Li measured using MC-ICP-MS and LA-ICP-MS in rocks that have evidence for interactions with fluids.

Two features observed in high grade blocks are probably products of fluid-rock interaction: actinolite-chlorite bearing rinds on blocks and cm-scale layers of blueschist interlayered with eclogite in some blocks. Whole rock, mineral separate, and mineral *in situ* analyses suggest that blocks experienced at least two distinct types of low- to high-T fluid-rock interaction. One event is manifest in intra-mineral concentric zoning of Ba, B and Li concentrations in block interiors. Relatively high concentrations of these elements within zones of white mica suggest interaction with a Ba-, B-, Li-rich fluid, possibly derived from subducted sediment or altered ocean crust at relatively high metamorphic grade. The other event is manifest in depletions of Li in bulk samples of rinds and blueschist layers compared to block interiors and eclogite layers respectively. Depletions of Li are also observed in white micas from rinds relative to block interiors, and *in situ* analyses of pyroxene and chlorite in blueschist layers compared to eclogite layers. The bulk rock and mica Li depletions are coupled with increases in δ^7Li. The mineralogic assemblages of the blueschist layers suggest that Li depletion took place during the retrogression. The cm-scale width of the layers suggests small-scale channelization of fluid as it infiltrated the blocks.