PAUL SCHERRER INSTITUT

PSI Colloquium

Cirrus clouds and the mysteries of upper tropospheric humidity

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DATE : **Monday, November 26, 2012**
COFFEE: **11:00 am**
SEMINAR: **11:15 am**
PLACE: **WHGA/001**

Abstract:

While clouds are known to have an overall cooling effect on Earth climate due to their high albedo reflecting a part of the solar light back to space, high cirrus clouds are warming, owing to their faint nature, which lets visible light pass but absorbs a part of the outwelling infrared. The global cirrus cover has been estimated to be about 25 %, with a frequency of occurrence more than 70 % in the tropics. In contrast water vapor makes a strong contribution to upper tropospheric cooling. Despite the importance of cirrus and upper tropospheric humidity for climate and atmospheric chemistry, the discovery of massive supersaturations with respect to ice in upper tropospheric cloud-free air and inside cirrus clouds calls into question our understanding of the physics of ice cloud formation. These findings represent potentially important modifications in characterizing upper tropospheric and stratospheric water and energy budgets, with implications for cloud formation, water and radiation fluxes, and upper tropospheric and stratospheric chemistry. This talk will also address various hypotheses recently put forward as explanations. These include: (1) potential out-of-cloud effects, such as low mass accommodation of H2O on aerosol, or vitrification of aerosols hindering homogeneous ice nucleation; (2) potential in-cloud effects, such as subresolution patchiness, or control by ice nuclei, or step pinning by impurities on the ice surface; (3) instrumental offset and accuracy issues impairing data quality. The most recent cirrus and water vapor measurements will be contrasted and compared with traditional textbook understanding.

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