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Polarized radiative transfer through terrestrial atmosphere and ocean: modeling with SCIATRAN

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The SCIATRAN 3.1 package is further development of the SCIATRAN 2.X software family which, similar to previous versions, comprises a radiative transfer model and a retrieval block. After an implementation of the vector radiative transfer model in SCIATRAN 3.0 the spectral range covered by the model has been extended into the thermal infrared. The databases of aerosol and cloud scattering characteristics are provided for the spectral range 0.2-40 microns. Another major improvement addresses the underlying surface effects. Among others, a sophisticated representation of the water surface with a bidirectional reflection distribution function has been implemented accounting for the Fresnel reflection of the polarized light. The effects of whitecaps were taken into account as well. A newly developed representation for a snow surface allows radiative transfer calculations to be performed within an unpolluted or soiled snow layer. Furthermore, a new approach has been implemented allowing radiative transfer calculations to be performed for a coupled ocean-atmosphere system. This means that, the underlying ocean is not considered as a purely reflecting surface anymore. Instead, full radiative transfer calculations are performed within ocean allowing the user to simulate the polarized raditive transfer both in the atmosphere and the ocean. Similar to previous versions, the simulations can be performed for any viewing geometry typical for atmospheric observations in the UV-Vis-NIR spectral range (nadir, limb, off-axis, etc.) as well as for any observer location within or outside the Earth's atmosphere including underwater observations. The new model is freely available for non-commercial use via the web page of the University of Bremen (www.iup.physik.uni-bremen.de/sciuatran). In this presentation a short description of the software package, especially of the new features of the radiative transfer model is given. In addition, some applications of SCIATRAN for the solution both atmospheric and ocean optics problems are presented.