

Assimilation of Remote Sensing Products by Climate Models with Updated Land Surface Process Schemes.

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The most advanced representation of terrestrial surface processes in climate models is confined to simplistic modules implementing one-dimensional (1-D) vertical exchange models. In particular, the radiation component of these 1-D modules relies on solutions derived from the so-called two-stream approaches applied notably to the case of vegetation canopies. The latter are, however, characterized by strong three dimensional (3-D) effects implied by the internal spatial variability of, for instance, the leaf area density, at all scales and resolutions involved (typically from 1 to 100 kilometers). This internal variability itself controls the radiation fluxes such as the fraction of radiation scattered, transmitted and finally absorbed by the vegetation canopy. Some of these fluxes, estimated from remote sensing measurements, are becoming nowadays operationally available from space agencies. Such remote sensing products can be ingested by climate models to the extent that the latter can explicitly and accurately represent these radiation quantities. In order to avoid the discrepancies and biases generated by 1-D radiation transfer models when representing 3-D effects, we propose a comprehensive 1-D scheme which introduces a parameterization of the internal variability of the vegetation canopies through a domain-averaged vegetation structure factor. We then present a computer efficient approach enabling us to assimilate operational remote sensing products into this updated two-stream radiation transfer scheme suitable for climate models.