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SOME RESULTS OF THE INTERCOMPARISON OF SHORTWAVE RADIATIVE TRANSFER CODES AND MEASUREMENTS

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Past model intercomparison efforts have shown poor agreement among shortwave (SW) radiative transfer models even for the simple case of pure water absorption. Recent studies indicate considerable underestimation in SW atmospheric absorption in cloud-free and possibly cloudy atmospheres. Thus to address these issues we have undertaken a study of over 14 commonly used, state-of-the-art models ranging in wavelength resolution from line-by-line models to broadband models.

Computation of components of SW irradiance forms the basis for comparison for these models. In order of increasing complexity the components are, direct solar irradiance at the surface, diffuse irradiance at the surface, diffuse upward flux at the surface and diffuse upward flux at the top-of-the atmosphere. Four cases are considered ranging from pure molecular 'standard' atmospheres to atmospheres with aerosols and atmospheres with a simple uniform cloud. A cloud-free case with measured atmospheric and aerosol properties and measured shortwave radiation components provides a reality check for the models. For the aerosol-free and cloud-free atmospheric case, models agree to within 1% in the computation of broadband direct solar irradiance for a dry atmosphere; the agreement is poor (5%) for a humid atmosphere. A comparison of atmospheric absorption, computed from the components of SW radiation, shows that agreement among models is 3% and 10% for dry and humid atmospheres respectively, a result that is much worse. This is understandable because computation of components other than direct solar irradiance depend on the ability of models to accurately represent multiply scattered energy in addition to using accurate molecular absorption. Of course not all models are equal, some being more accurate than others. More results for cases including aerosols and clouds will be presented and discussed.

More information on the intercomparison effort can be obtained at <http://www.ecd.bnl.gov/~halthore/intercomp/intercomparison.html>