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CLOUDLESS AND ALL-SKY DOWNWELLING BROADBAND AND SPECTRAL SOLAR IRRADIANCES PARTITION INTO DIRECT AND DIFFUSE OVER THE CENTRAL AMAZONIA: DIURNAL AND SEASONAL VARIABILITY

Atmosphere-surface (ocean/vegetation/ice) interactions in a changing climate

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Biophysical andchemistry modules in current climate models require, as input, detailed prognosticof downwelling solar irradiance at the surface, nominally spectral distributionand partition into diffuse and direct components. However, Radiative Transfer Models(RTMs) existing in most climate models struggle to predict accurately solar diffuseand spectral irradiance, in particular under polluted and cloudy conditions. So,in this regard, there is a need to improve current knowledge on the shortcomingsof these RTMs. Closure experiments comparing RTM simulations with measurements iscertainly a valuable method to do so. The present study uses measurementsperformed by a Multi-Filter Rotating Shadow-band Radiometer (MFRSR) operating 50km upwind from Manaus in the context of ACONVEX (Atmospheric CONVectionEXperiment) to characterize diurnal and seasonal variability of the cloudlessand all-sky broadband and spectral surface irradiances, as well as thepartition into direct and diffuse over the Central Amazonia. Results forcloudless conditions are applied in a preliminary closure experiment aiming toevaluate a RTM, i.e. the Santa Barbara DISORT Atmospheric Radiative Transfer(Ricchazzi et al., 1998). For broadband irradiance, observed minimum DiffuseGlobal Ratio (DGR) varied from ~10% (at SZA=20°) to ~20 % (at SZA= 75°) while modeled DGR variedfrom ~10% to ~25%, for the same SZA range. For the spectral channel 414 nm,under identical Sun geometry, minimum DGR varied from ~20% to ~70%, for bothobservations and RTM predictions. These results suggest that under molecular scatteringregime (cloudless and unpolluted conditions), when GDR is expected to be low,model performance is consistent with measurements. On the other hand, for higherGDR conditions, in spite of being driven by observed optical properties, modelis unable to reproduce GDR observed variability, in particular for SZA lowerthan 60° and for broadband irradiance.