



Measuring solar- and greenhouse radiation profiles in the atmosphere using upper-air radiosondes

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Solar shortwave and thermal longwave irradiance is usually measured at the Earth's surface with ground radiation stations and at the top of the atmosphere with satellites. Here we show for the first time radiative flux profiles and the radiation budget in the atmosphere measured with radiosondes ascending from the Earth's surface to 35 km into the stratosphere. During two-hour flights solar shortwave and thermal longwave irradiance, downward and upward, is measured with four individual sensors at one-second resolution, along with standard PTU radiosonde profiles. Nighttime longwave radiation measurements are contrasted to daytime measurements and 24 hours means of radiation budget- and total net radiation profiles are shown. Of particular interest for greenhouse effect investigations are in situ measured longwave greenhouse radiation profiles and their vertical changes in relation to temperature, clouds, water vapour and other greenhouse gases.