

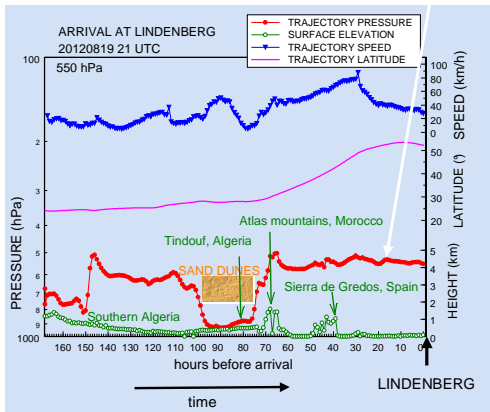
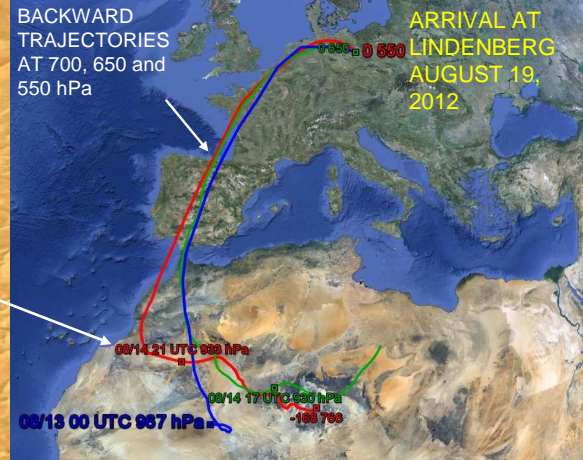
Sahara dust effect on solar UV radiation components

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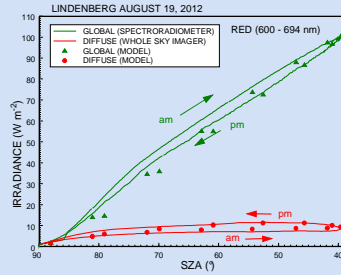
1. Trajectories

Based on archived three-dimensional pressure and wind fields from the DWD global model GME trajectories for August 19, 2012 for 7 days backwards at Lindenberg (52.2086°N, 14.1213°E, 127 m asl) indicate an uplift of air from levels close to the desert surface in the central Sahara region (south and southwest Algeria and Mali) on August 13 to August 14 and transport to the middle troposphere (5 km height) over Central Europe

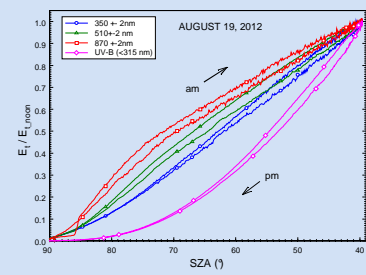
- 550 hPa trajectory to Lindenberg for 168 h backward in time (red)
- air descends to heights close to the desert surface at 400 m asl (green) 4 days before arrival, and moves westward over more than 500 km by up to 50 km/h speed
- Tindouf had 8.7 km visibility, a maximum temperature of 45°C, and a dew point of 8°C (minimum relative humidity 5%)



ii) RED VISIBLE (600 – 694 nm FBHM)
 - GLOBAL (array spectroradiometer): decrease am to pm
 - DIFFUSE (Whole Sky Imager radiances) increase am to pm; correspondence to LibRadtran model results better for WSI than for spectroradiometer



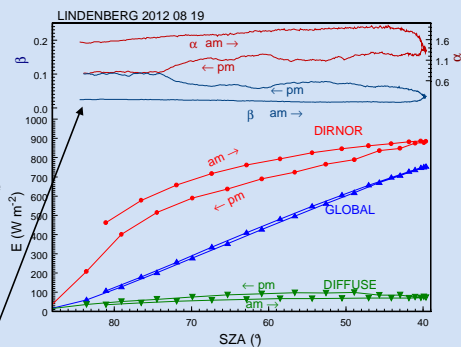
iii) 350, 510, 870 nm and UV-B
 global irradiance normalized to daily maximum from array spectroradiometer and fast scanning UV spectroradiometer → values for am higher than for pm



2. Solar radiation at Lindenberg

i) VIS/NIR IRRADIANCE COMPONENTS

- Aerosol optical depth
 - LibRadtran model 10-min results
 SZA: solar zenith angle



MEASURED ANGSTROM COEFFICIENT α AND TURBIDITY β

GLOBAL: no change from am to pm
 DIFFUSE: increase by 36 W m⁻² (\approx 34% at SZA 45°) from am to pm
 DIRNOR: decrease by 75 W m⁻² (SZA 45°) to 140 W m⁻² at high SZA from am to pm

iv) UV ERYTHEMAL COMPONENTS

lines: MEASURED (2 spectroradiometers SPECTRO 320 D global and diffuse)
 symbols: LibRadtran modeled using measured AOD and SSA=0.62 [1]

GLOBAL: decrease
 DIFFUSE: no change
 DIRNOR: decrease
 from am to pm

References

[1] Bais, A. F., A. Kazantzidis, S. Kazadzis, D.S. Balis, C.S. Zerefos, and C. Meleti (2005), Deriving an effective aerosol single scattering albedo from spectral surface UV irradiance measurements. Atmospheric Environment 39, 1093–1102.

