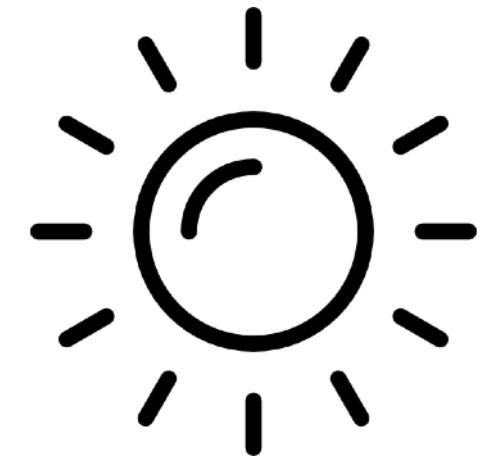
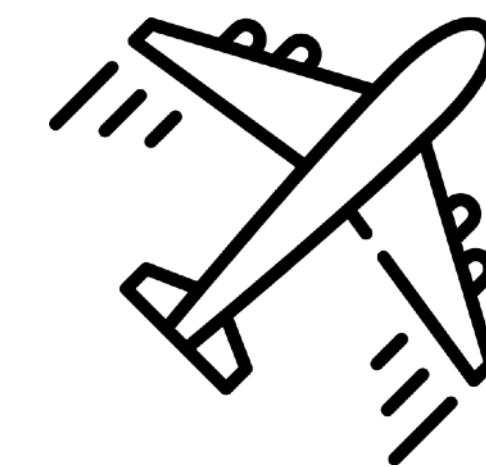
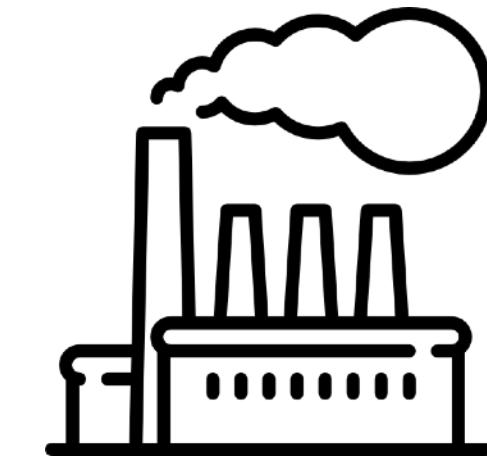
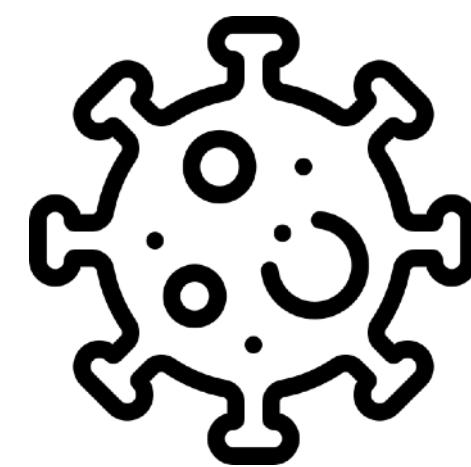


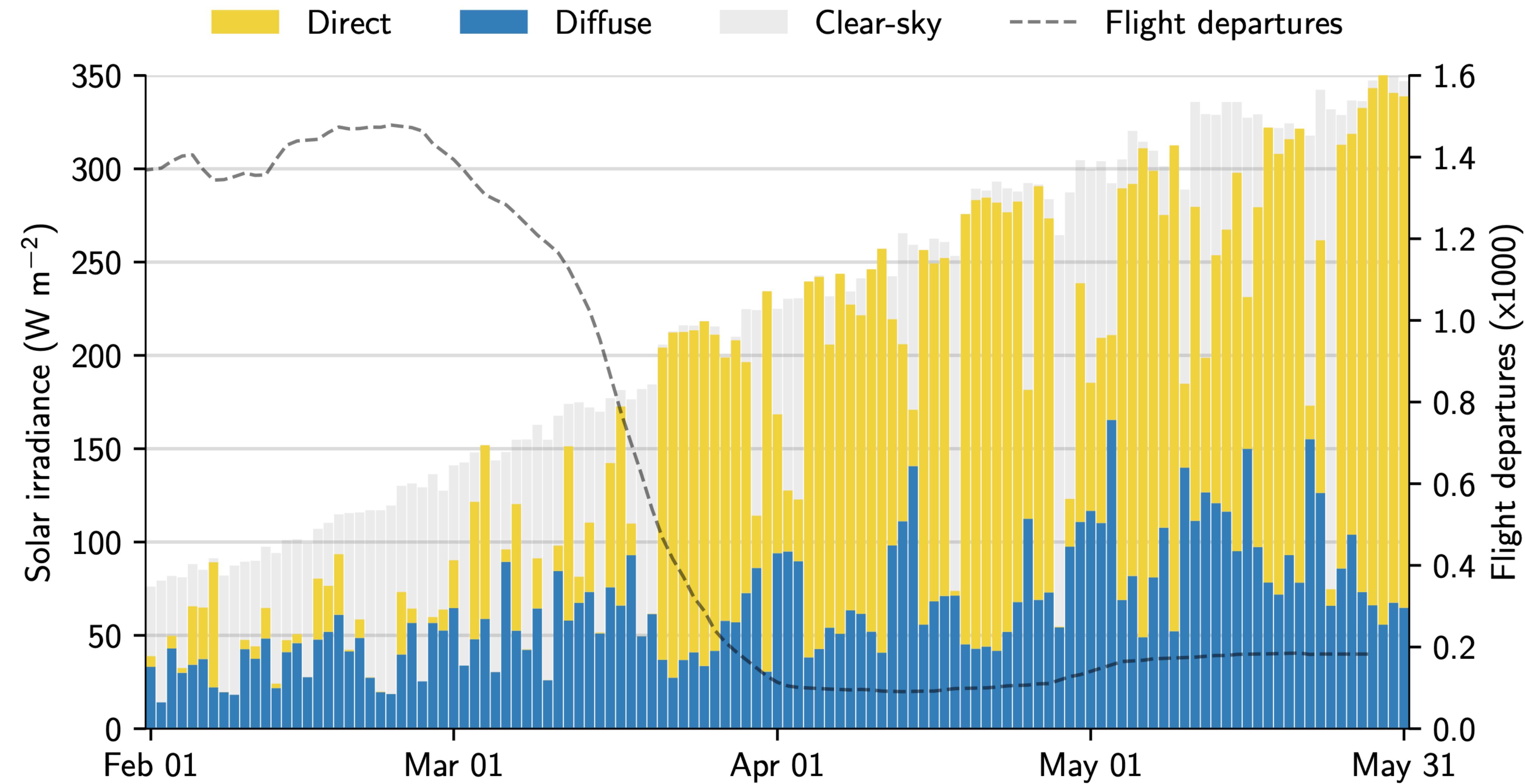
# Record high solar irradiance in Western Europe during first COVID-19 lockdown due to unusual weather or cleaner air?

Chiel van Heerwaarden, Wouter Mol, Menno Veerman, Imme Benedict, Bert Heusinkveld,  
Wouter Knap, Stelios Kazadzis, Natalia Kouremeti, and Stephanie Fiedler

8 April 2021



2020 had an exceptionally sunny spring that coincided with the first COVID-19 lockdown



Surface irradiance (BSRN station Cabauw, NL) and Flight departures (Western Europe)

Hypothesis: the COVID-19 lockdown has contributed to the sunny weather

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## Lockdown heeft Nederland zonniger gemaakt

**Meteorologie** Tijdens de lockdownperiode bereikte meer zon het aardoppervlak door afgenoemde luchtvervuiling. Dat blijkt uit voorlopige berekeningen van het KNMI.

✉ Marcel aan de Brugh ⌂ 24 juli 2020 ⌂ Leestijd 1 minuut



**Trouw**

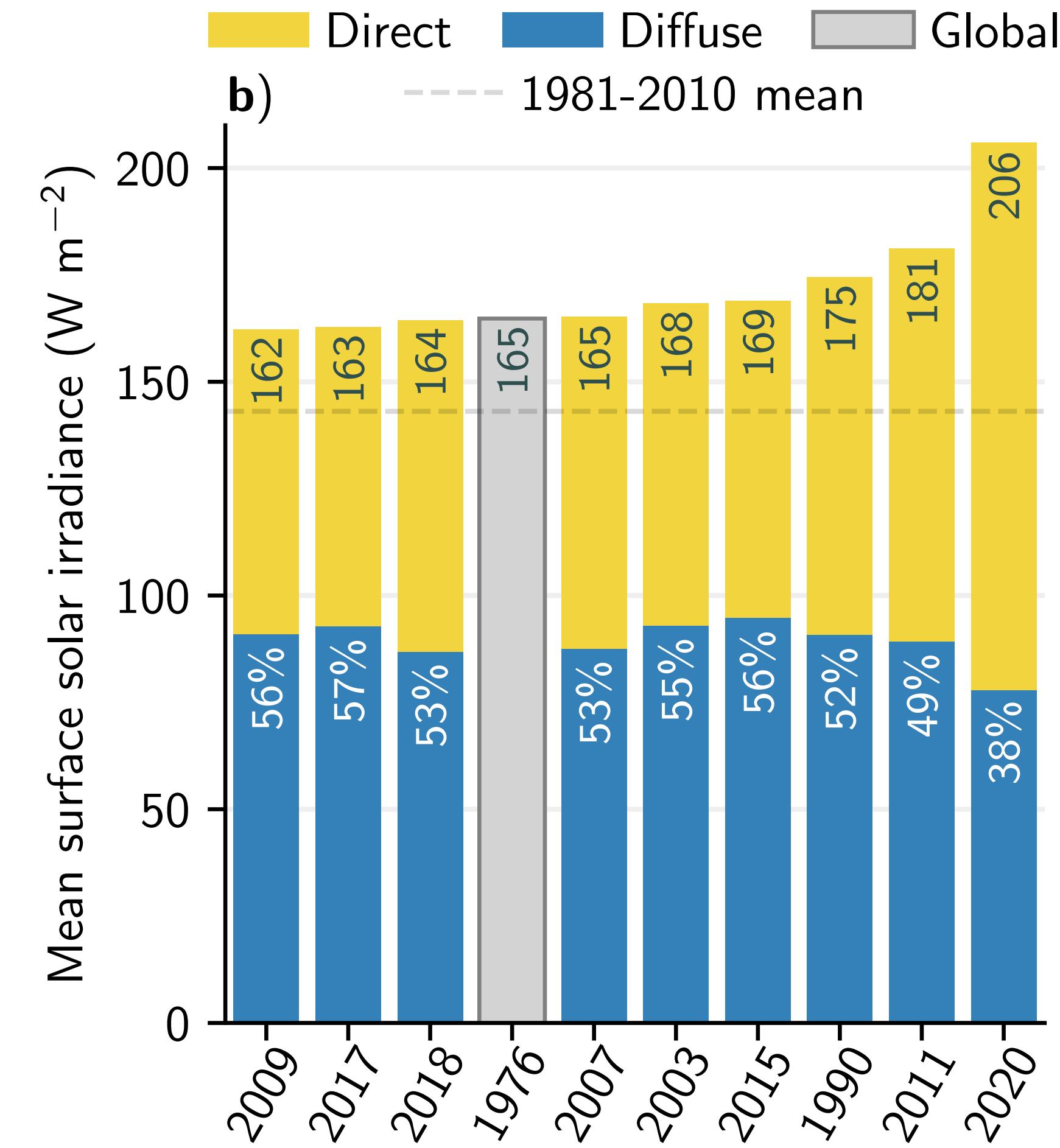
# Zonder vliegtuigen leveren mijn zonnepanelen record na record

7 april 2020

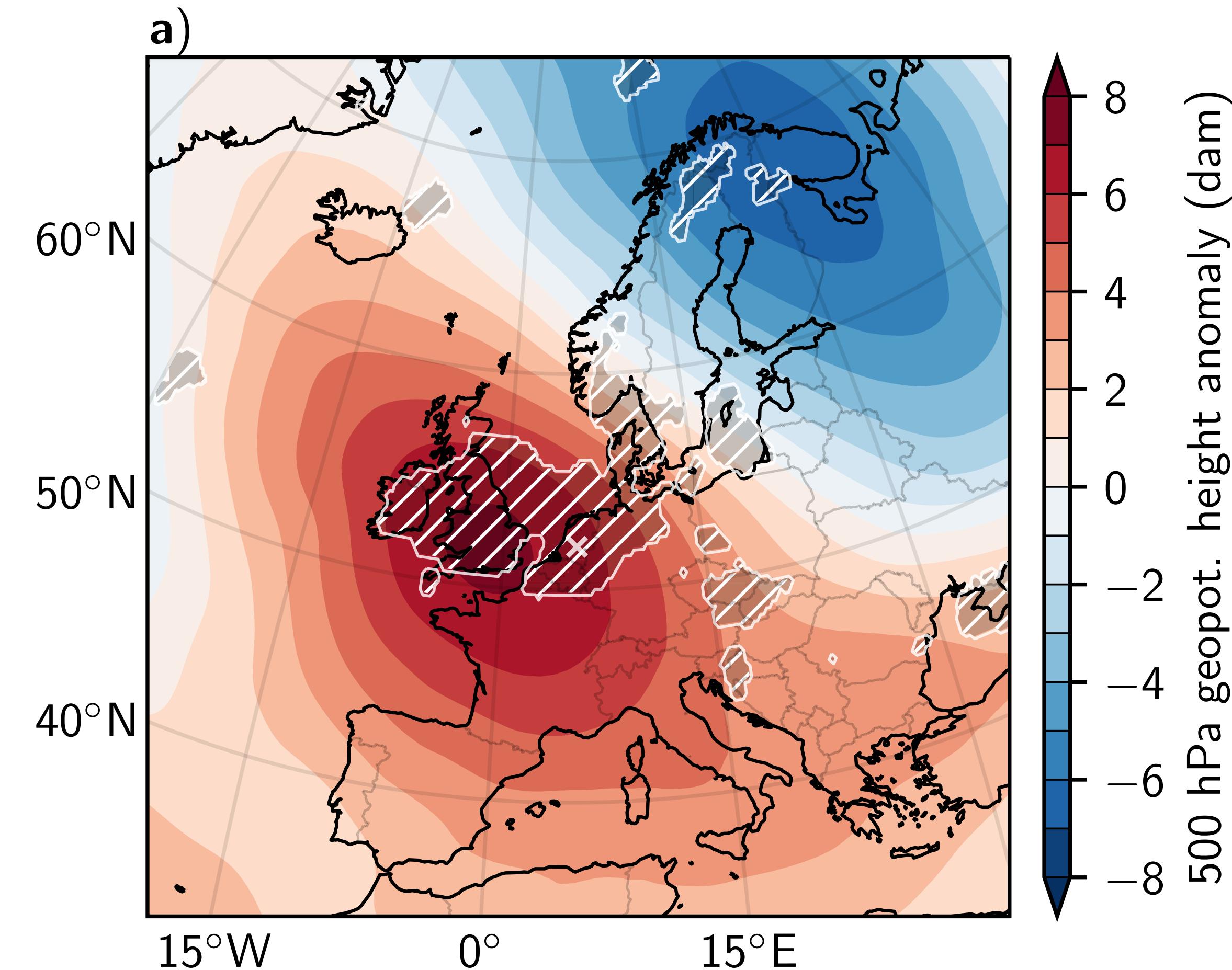


*“My solar panels are having record yields without planes in the sky” / “Lockdown made the Netherlands sunnier”*

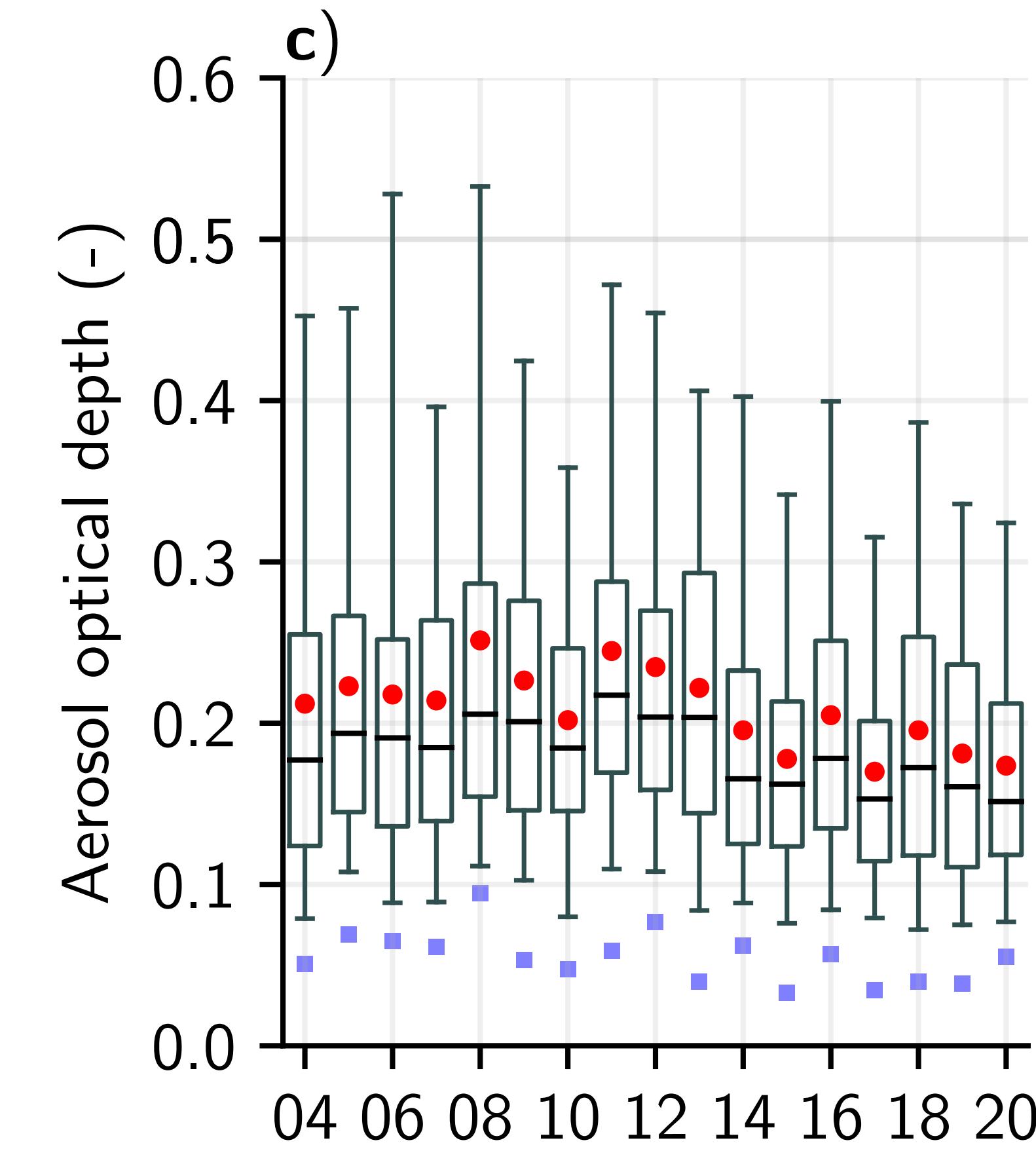
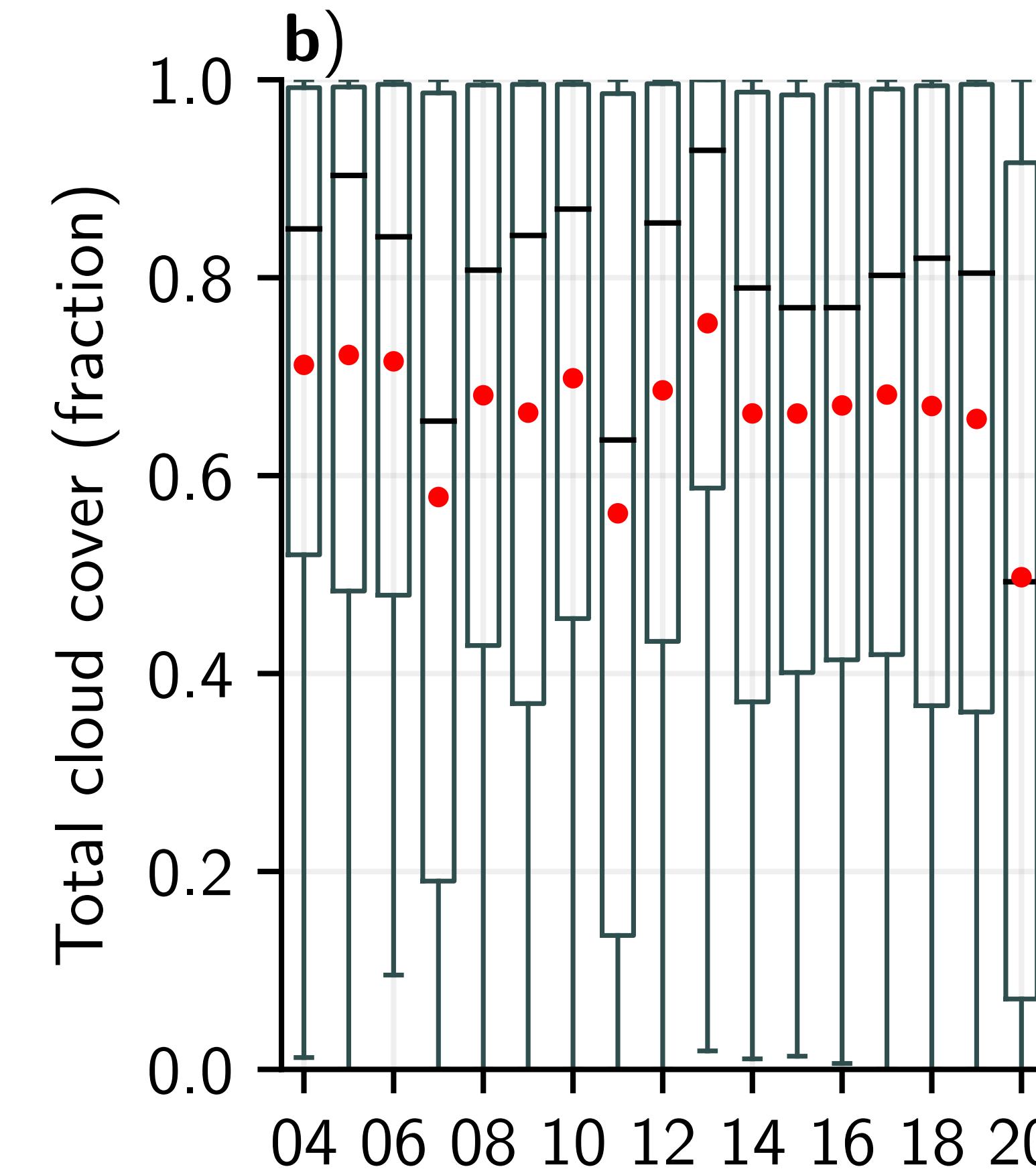
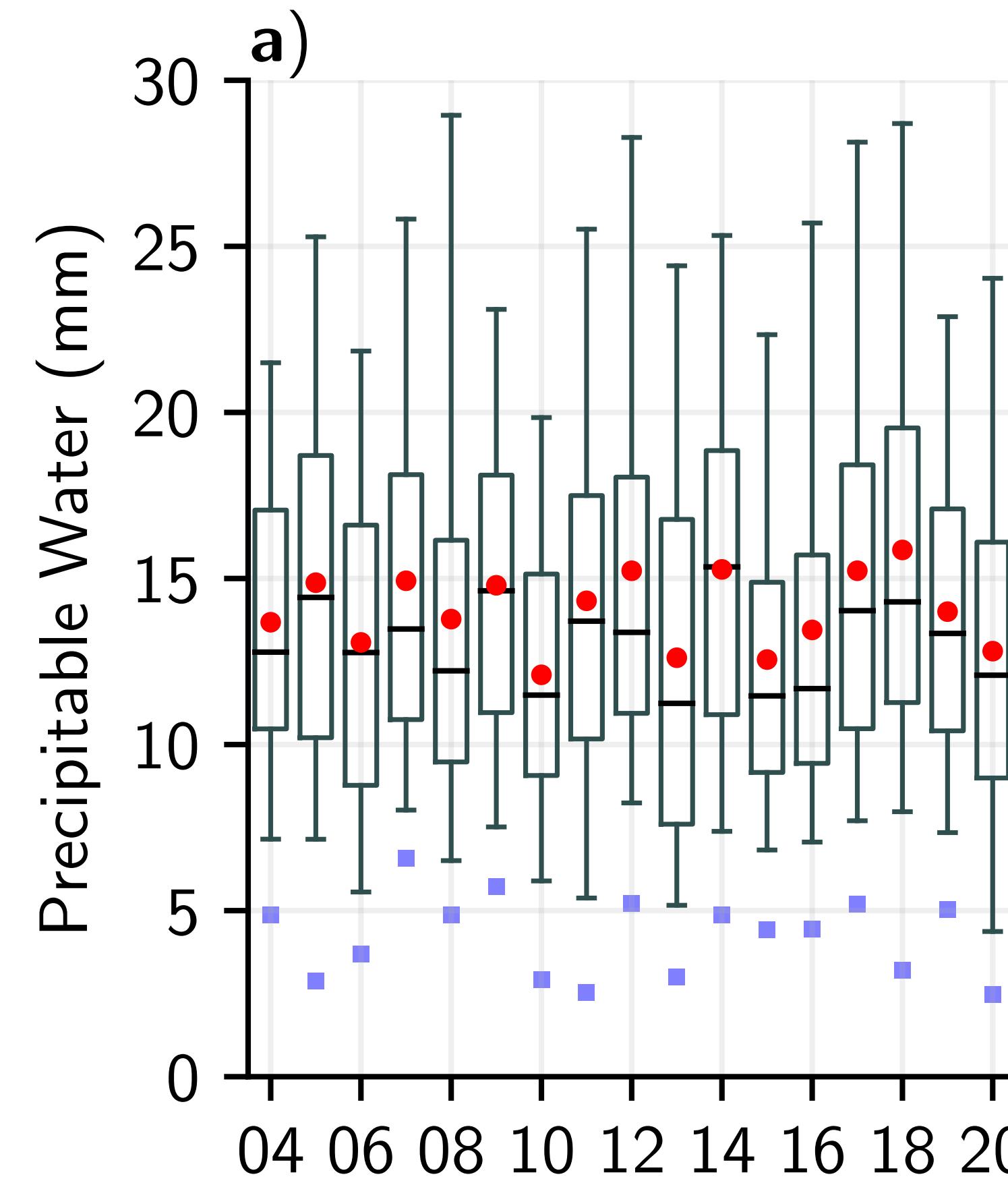
# Veenkampen station measured the highest surface solar irradiance since 1928 (by a leap)



# The large-scale circulation was favourable for dry and anticyclonic weather

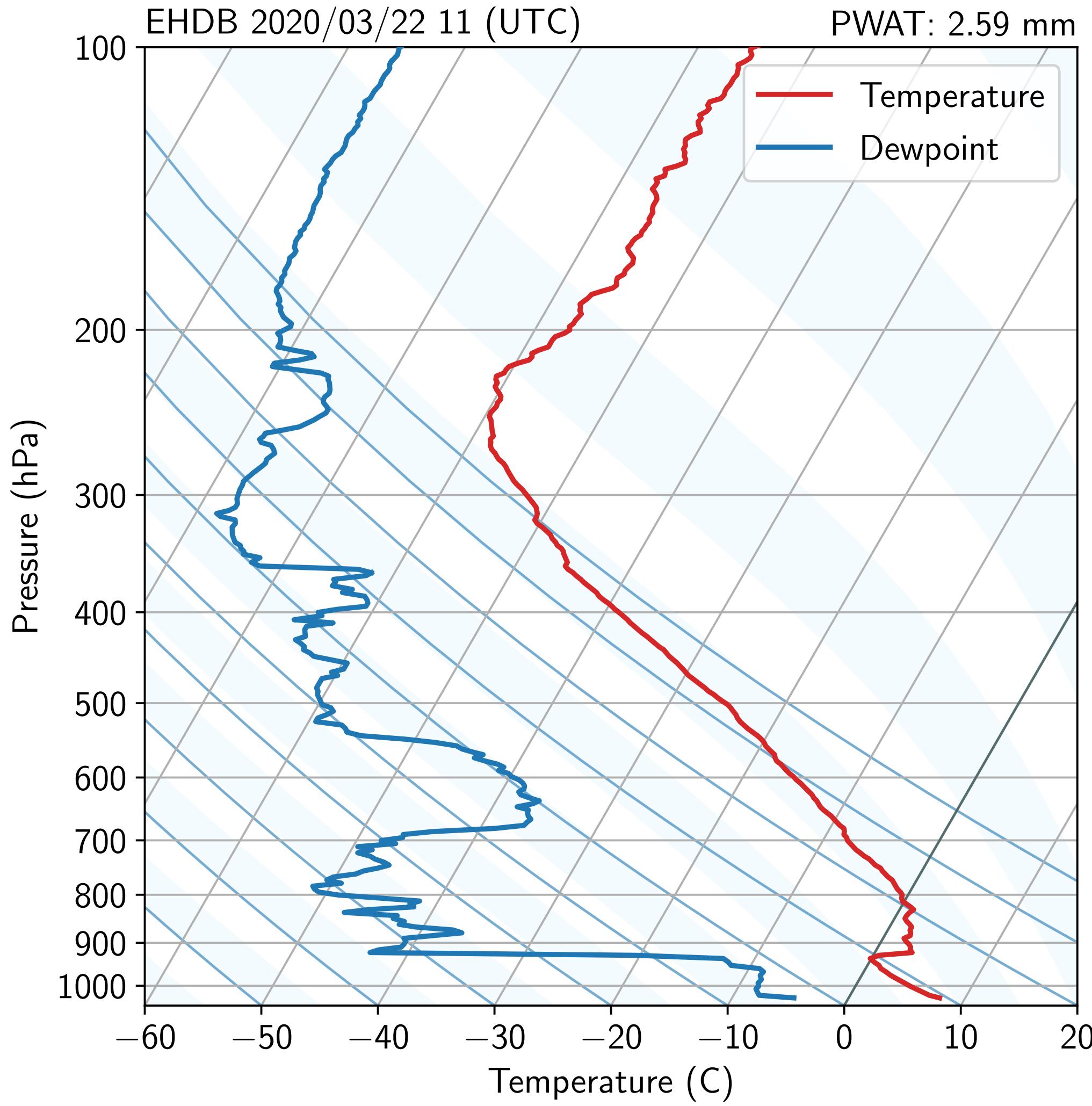


# Precipitable water and aerosol optical depth were low, but only cloud cover stood out



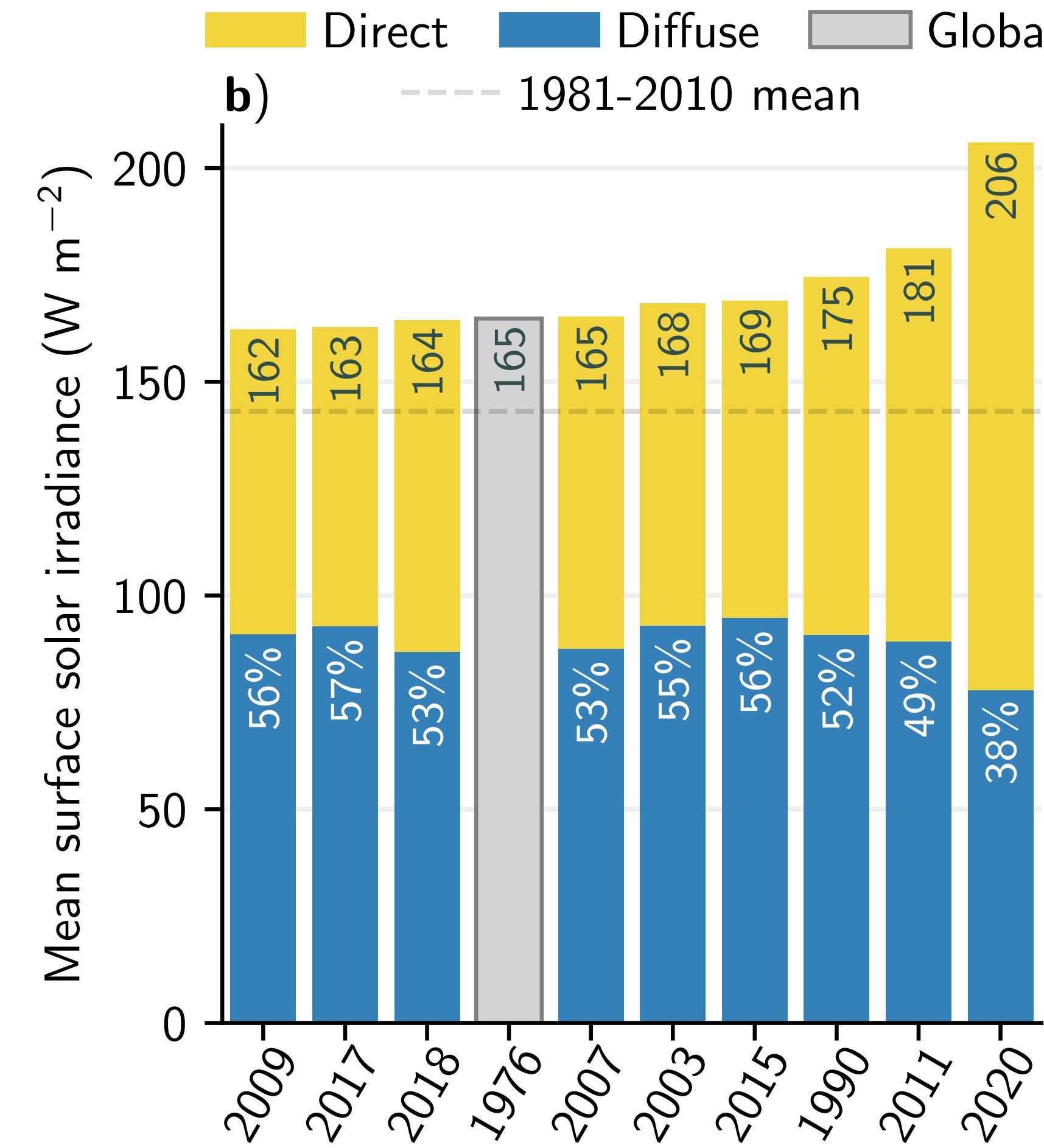
*precipitable water and total cloud cover from ERA5, aerosol optical depth from CAMS*

# Unfavourable conditions for aircraft contrails

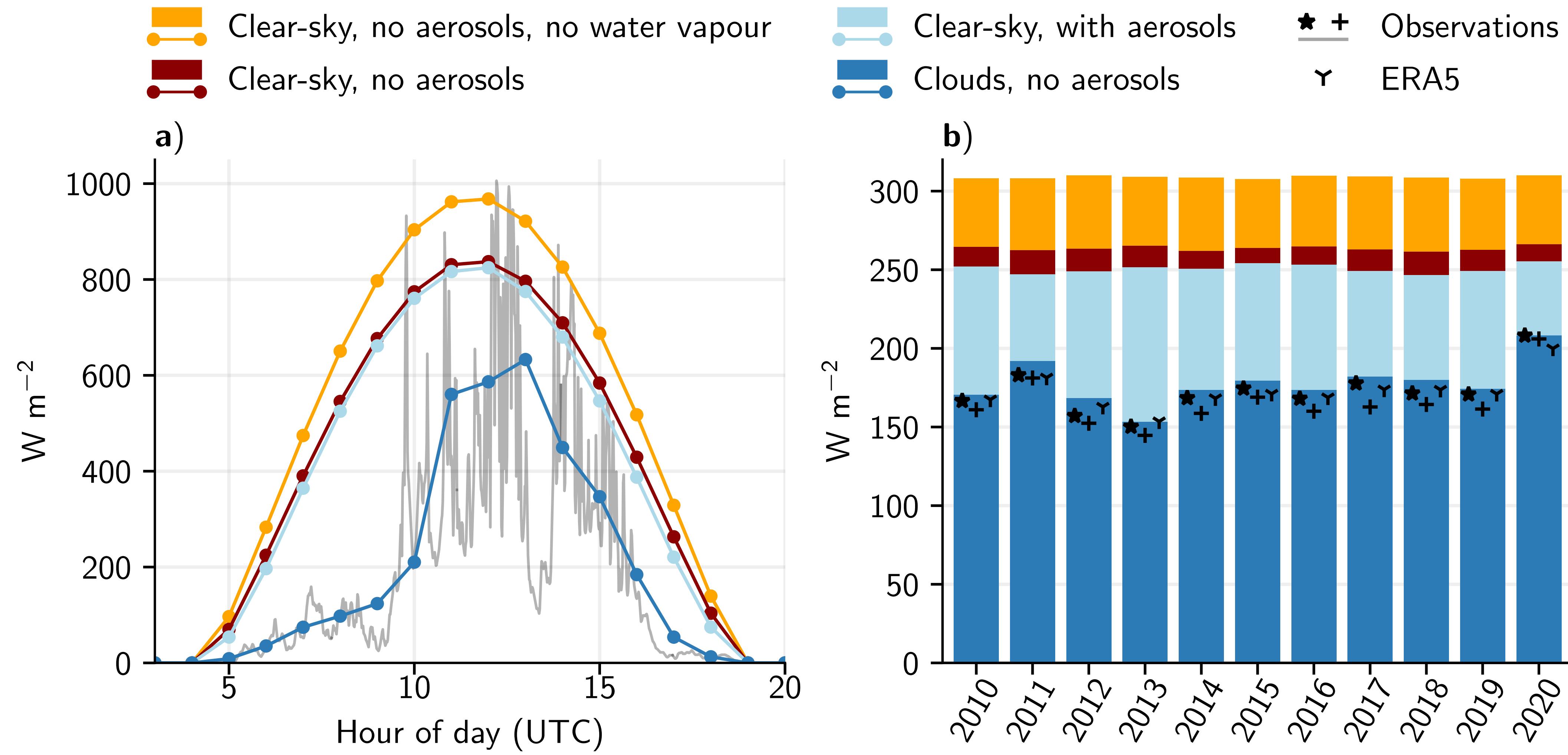


*radiosounding from De Bilt and Cabauw BSRN sky view camera on the 22<sup>nd</sup> of March 2020*

The diffuse fraction is extremely low due to clean and dry air, but also contrails play a role



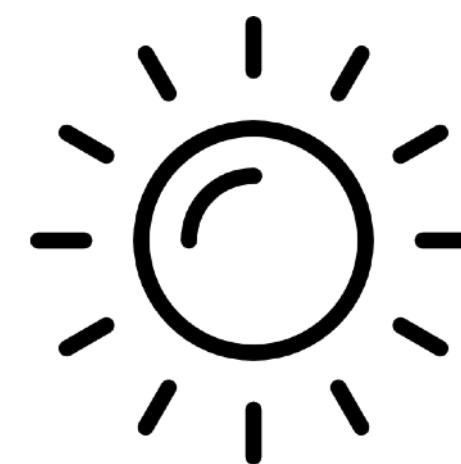
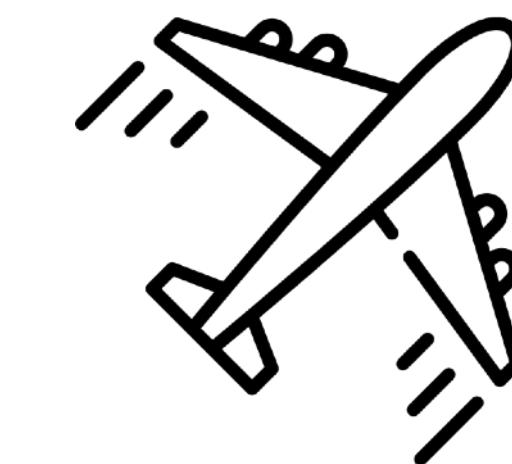
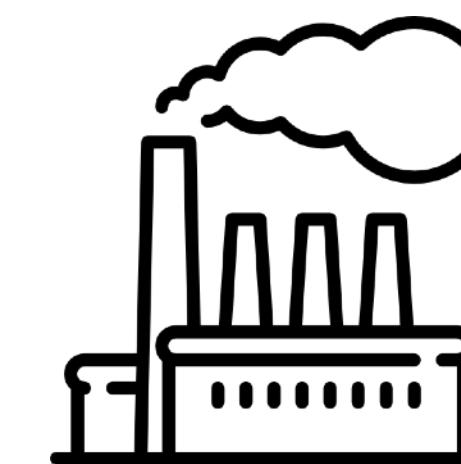
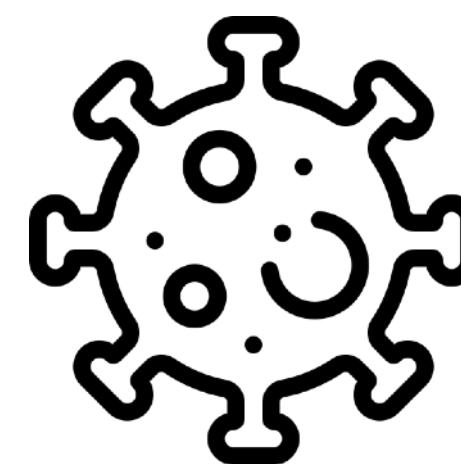
# Radiation model: meteorology contributed +30.7 W m<sup>-2</sup> and air quality +2.3 W m<sup>-2</sup> to record



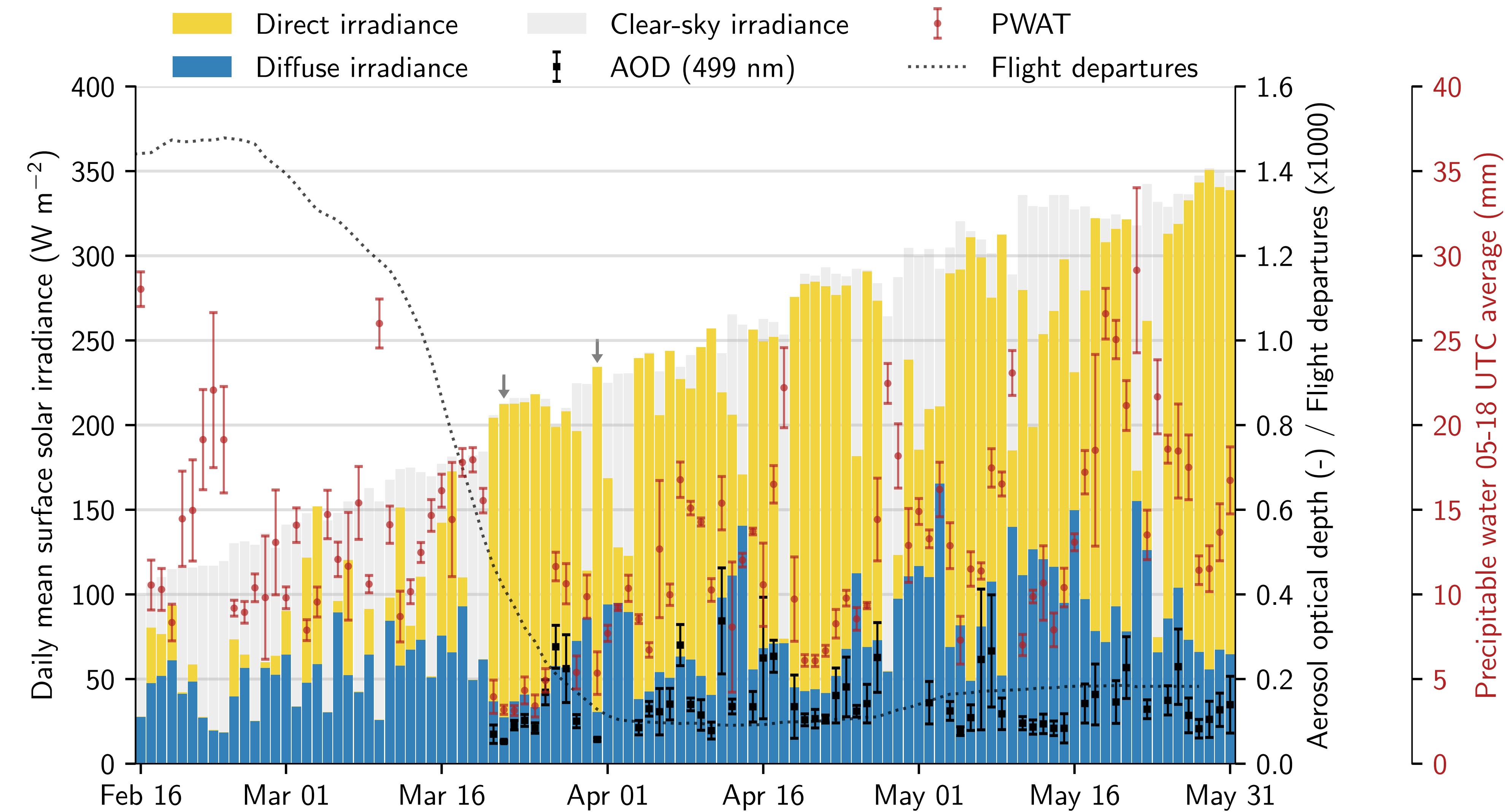
*calculations done using RTE+RRTMGP, clear sky with aerosols reference from CAMS McClean*

# Record high solar irradiance in Western Europe during first COVID-19 lockdown largely due to unusual weather

1. *Spring 2020 had the highest surface solar irradiance ever observed*
2. *Exceptional weather was ~13 times more important than cleaner air due to lockdown*
3. *Record low diffuse fraction enhanced by less air traffic, but small impact on total irradiance*

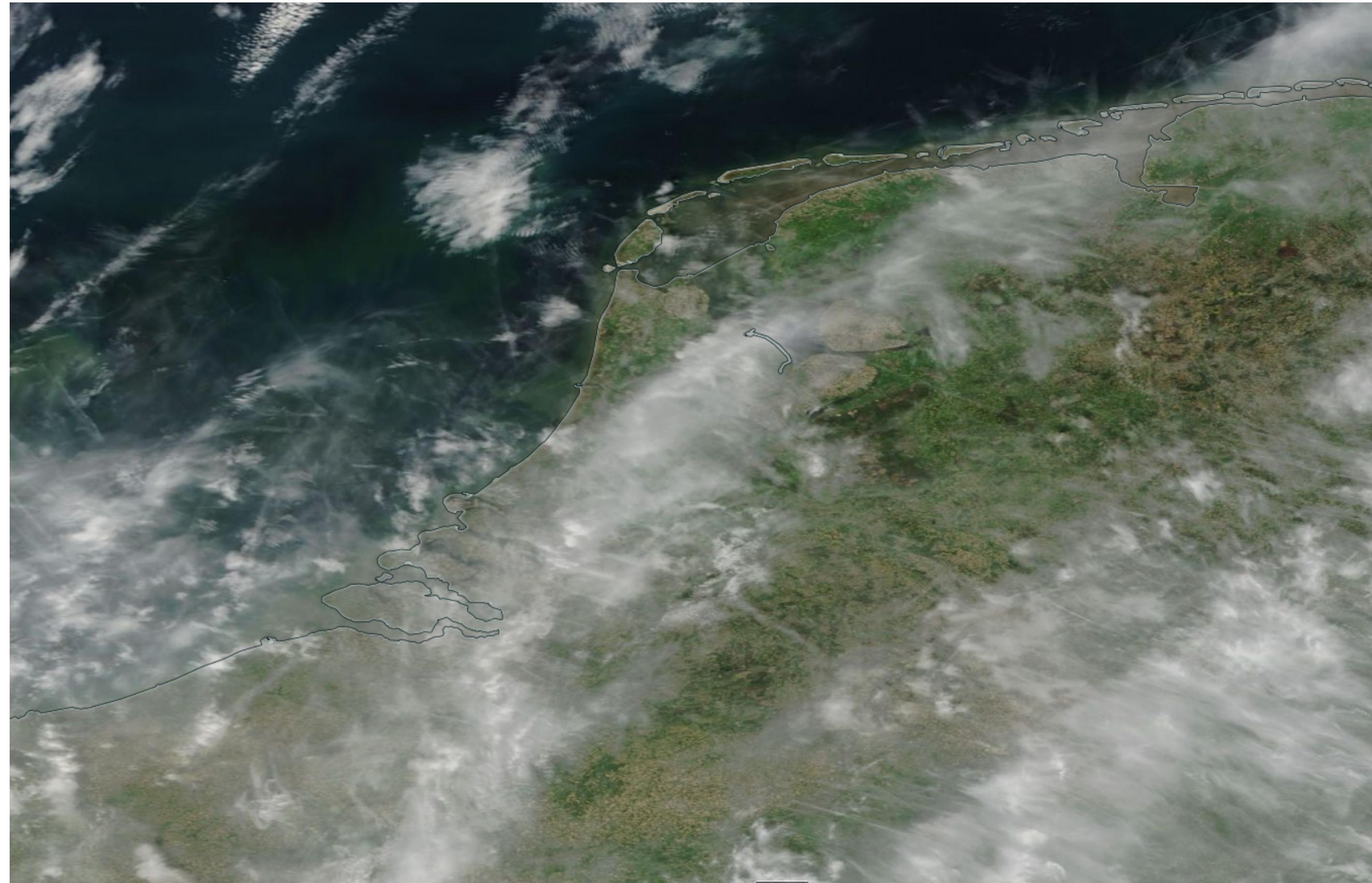


# Spring 2020 had many very dry days, an overall low AOD, and almost no overcast days

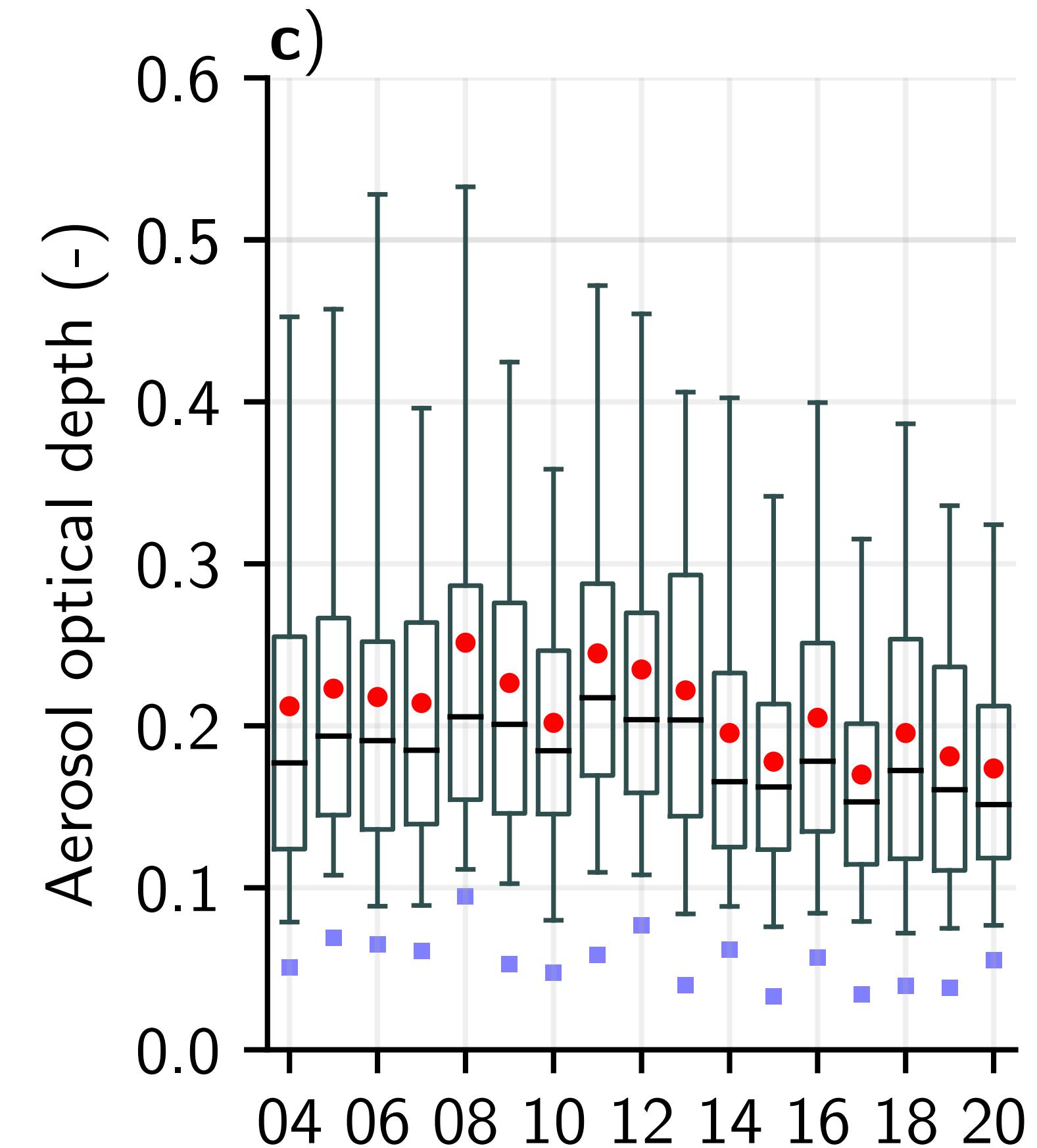


*surface irradiance and AOD observations from BSRN station Cabauw*

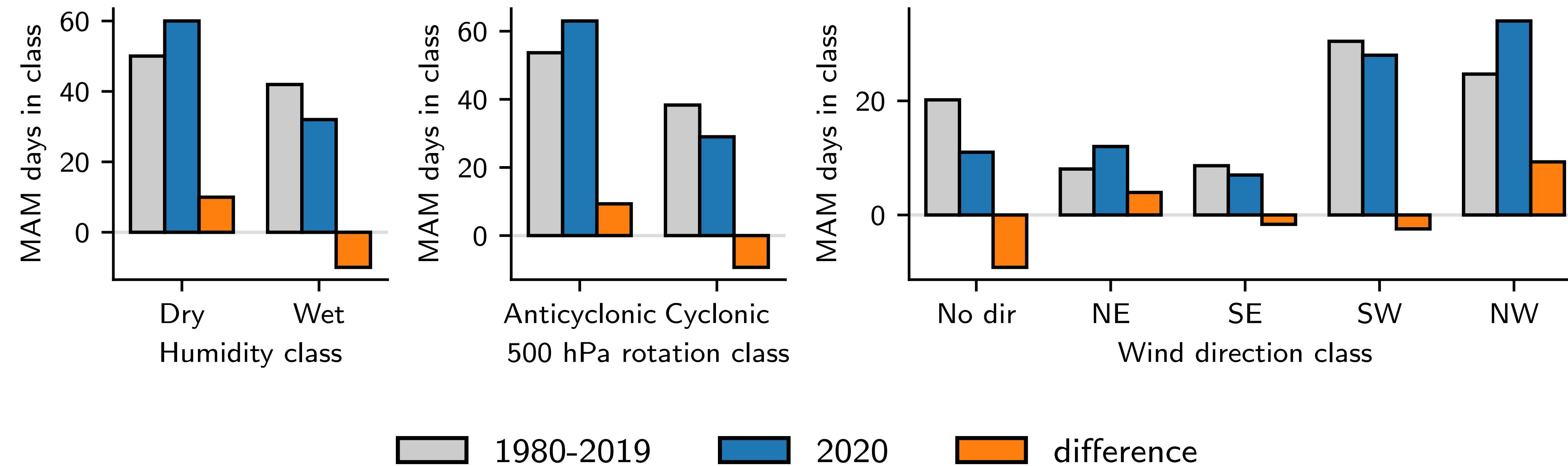
# Contrail reduction in 2020 is more than expected from comparison with 2011 and 2015



*manual inspection of NASA Worldview images*



# The objective classification system of DWD showed anomalous dry and anticyclonic weather



Hypothesis: the COVID-19 lockdown has contributed to the sunny weather



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Marcel aan de Brugh 24 juli 2020 Leestijd 1 minuut



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