

# Bush fires & the Crab Nebula

How aerosols can affect observations with the H.E.S.S. telescopes

Tim Lukas Holch

Darmstadt, 21.10.2022

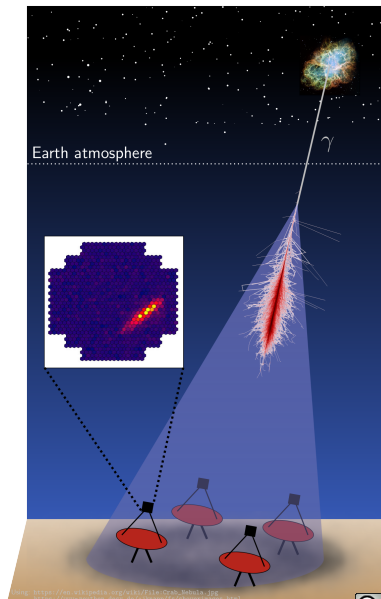
# The H.E.S.S. telescopes?



# Gamma-ray astronomy with H.E.S.S.

## The High Energy Stereoscopic System

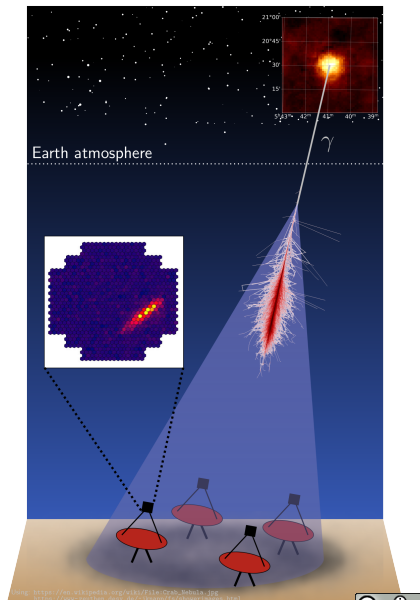
- > Five imaging atmospheric Cherenkov telescopes
- > Khomas Highland in Namibia, 1.8 km a.s.l.
- > Exploring the non-thermal universe
- > Very high energy (VHE) astronomy, i.e. photons from 10s of GeV up to  $\sim 100$  TeV



# Gamma-ray astronomy with H.E.S.S.

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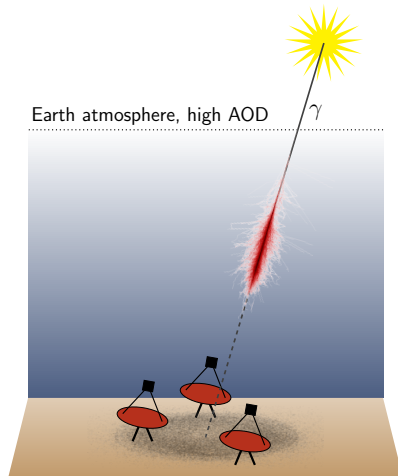
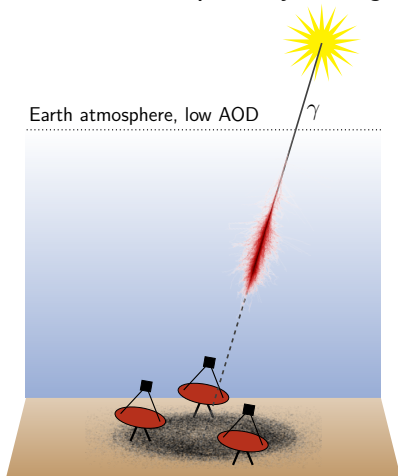
# Bush fires?



# Varying aerosols!

Change in atmospheric conditions  $\Rightarrow$  Exchanged calorimeter!

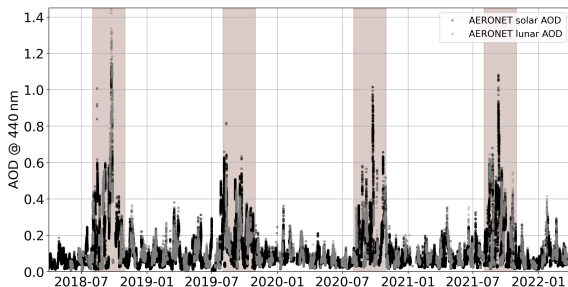
*Aerosols have an especially strong effect on transmission between 300 and 600 nm.*



$\rightarrow$  **Misreconstructed shower energies if not taken into account!**

# How are the conditions at the H.E.S.S. site?

- > **AERONET** photometer operated by NASA and NUST on the H.E.S.S. site
- > *Extremely* elevated aerosol levels every year from August to October



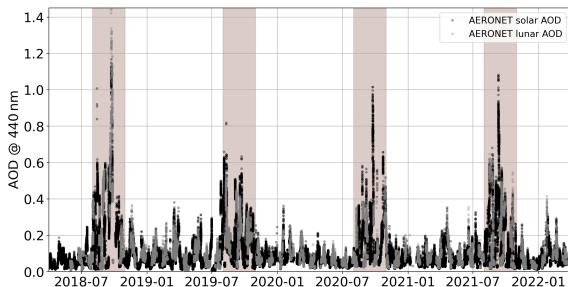
Aerosol optical depth as measured by the HESS station of the AERONET.



The AERONET station at the H.E.S.S. site.

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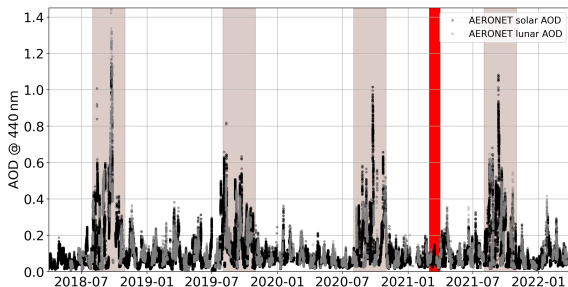


Photo: T.L. Holch

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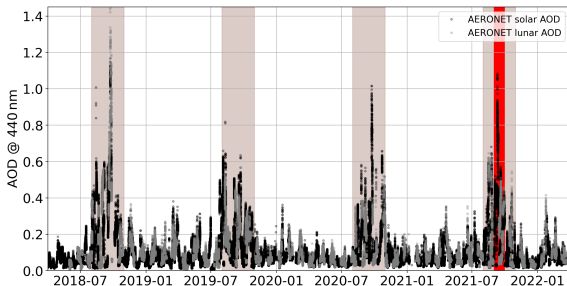
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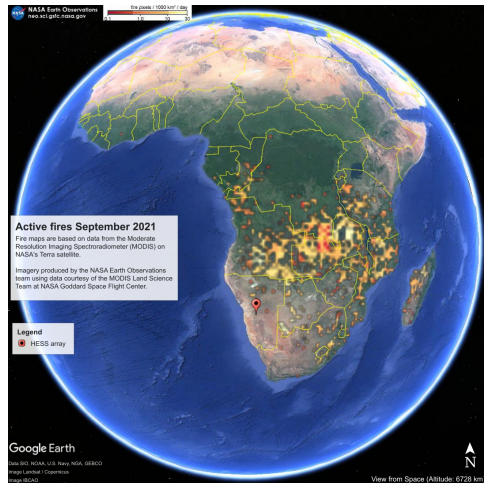
Fire data taken from the [NASA Earth Observations website](https://neo.sci.gsfc.nasa.gov).

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# The Crab Nebula?



# Flux or aerosol variations?

The Crab Nebula is

- > the first ever detected gamma-ray source  $>100$  GeV
- > often used as a reference source (sometimes as *standard candle*)

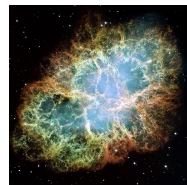
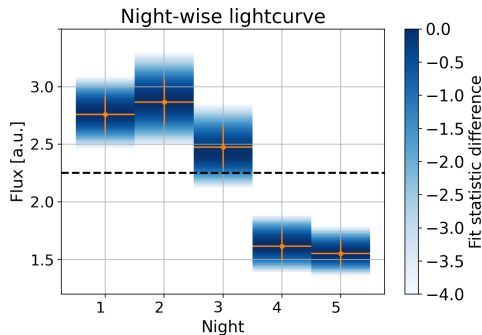
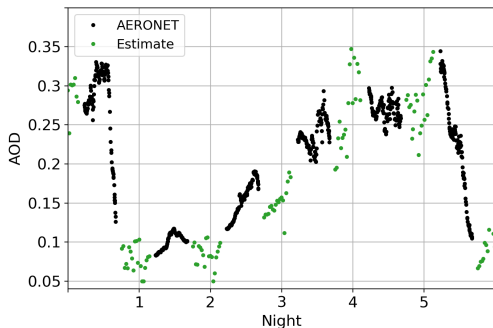
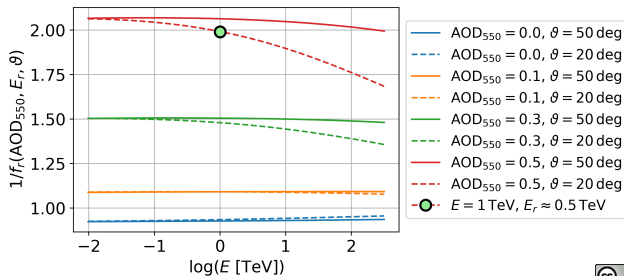
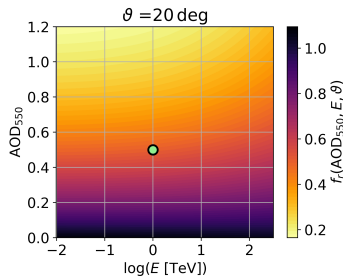
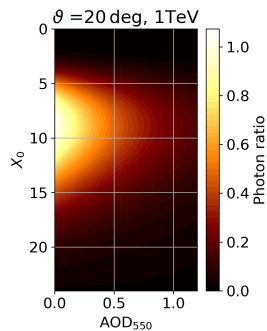
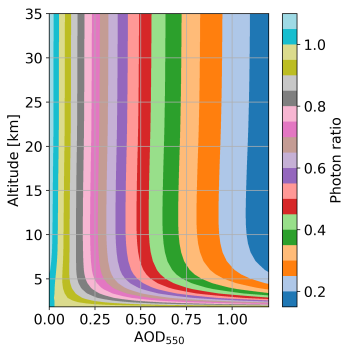
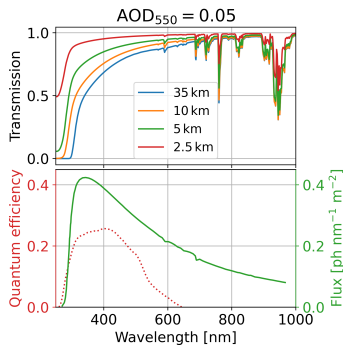


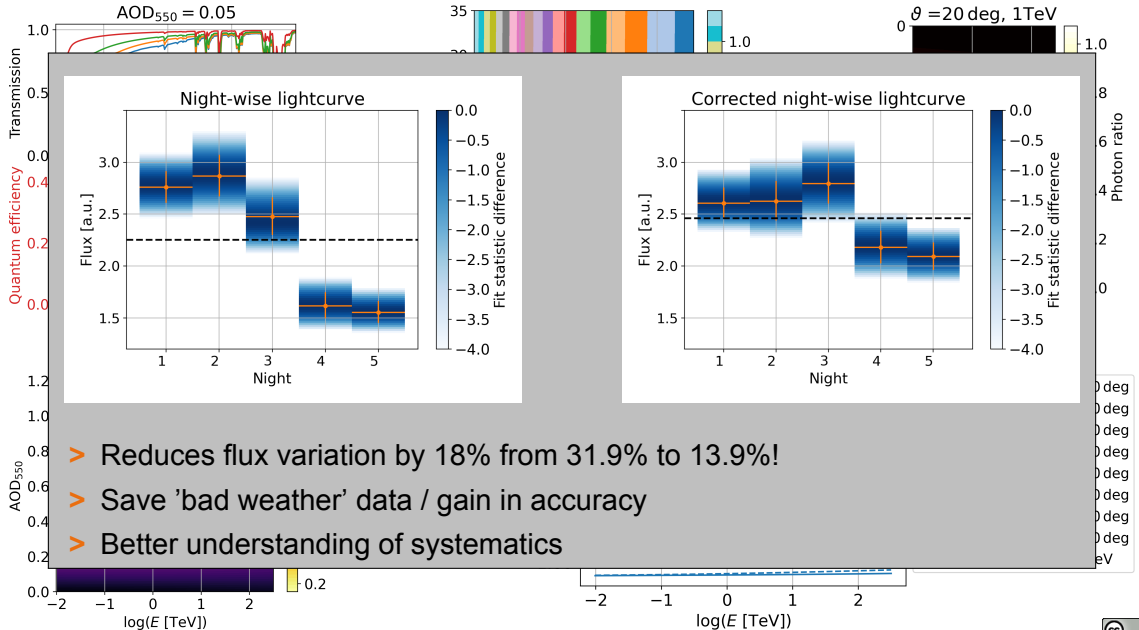
Image from [Wikipedia](#).



# Developments at DESY: Atmospheric corrections!



# Developments at DESY: Atmospheric corrections!



- Reduces flux variation by 18% from 31.9% to 13.9%!
- Save 'bad weather' data / gain in accuracy
- Better understanding of systematics

# Thank you!

## Contact

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Synchrotron DESY

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