

Cherenkov Telescope Ring

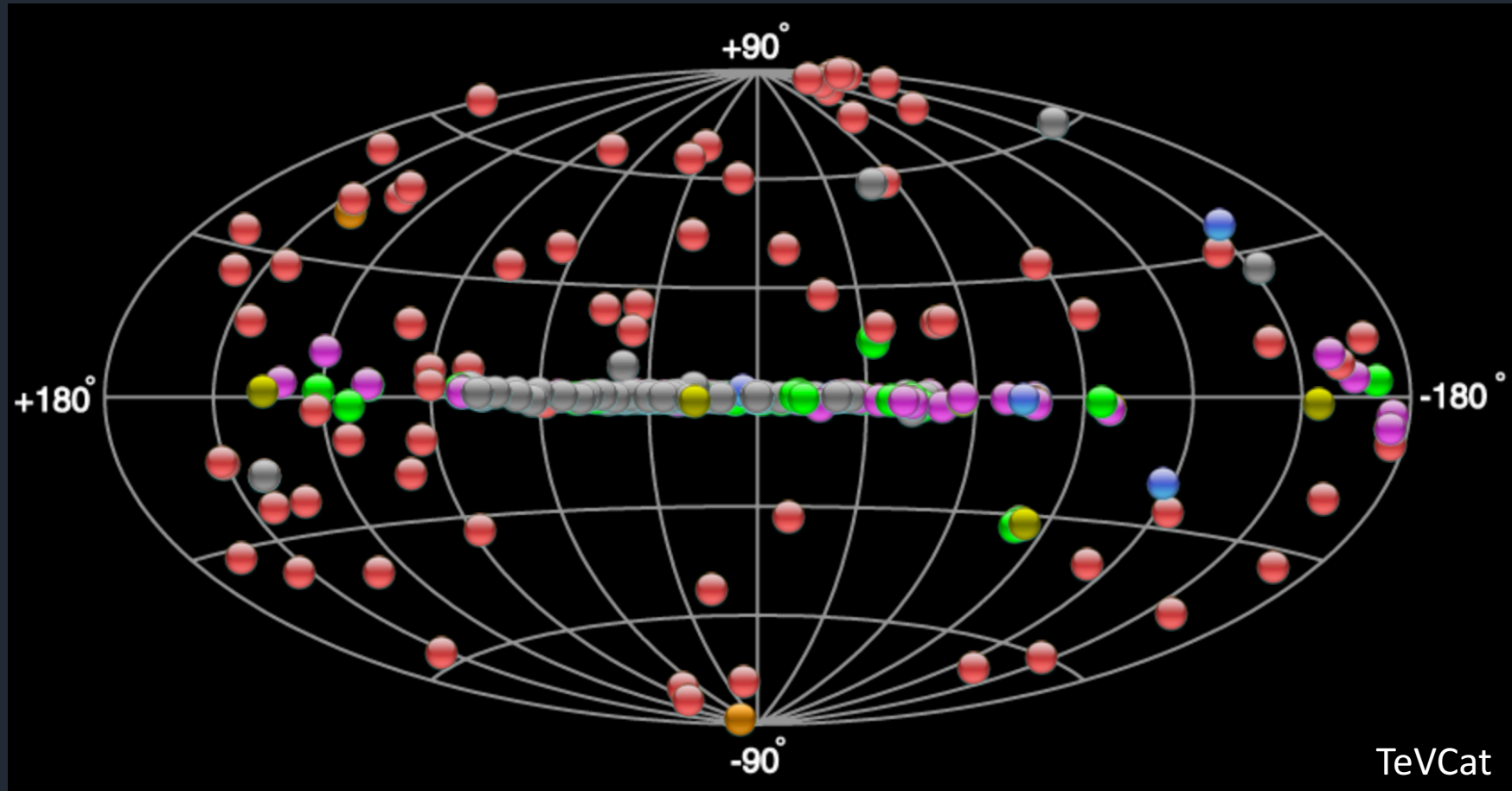
An Idea for World-Wide Monitoring of the VHE Sky

Dominik Elsässer , Wolfgang Rhode, Tim Ruhe,
M. Nöthe, K. Brügge
TU Dortmund

Where we are

- Several highly successful VHE facilities (VERITAS, H.E.S.S., MAGIC, FACT, HAWC)
- CTA prototypes progressing well
- Lots of interesting sources to study and physics problems to solve

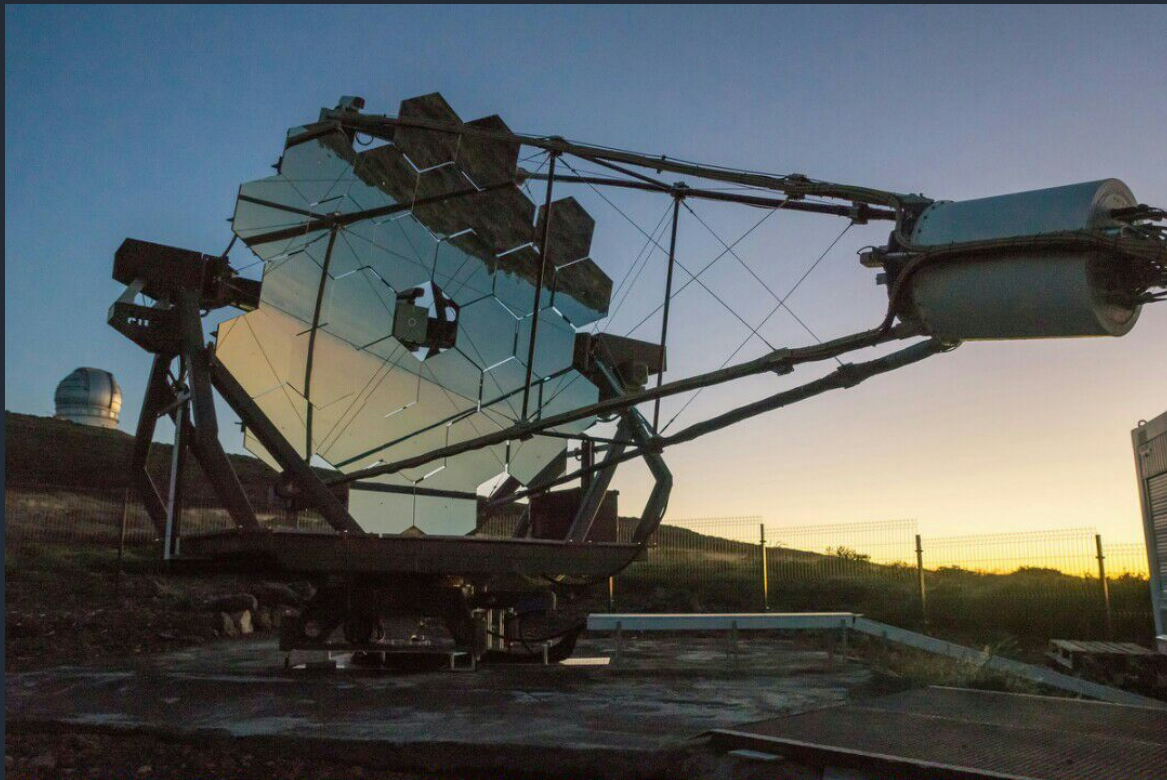
The VHE Sky in 2018: A VHE success story



Why is there even a need to act now?

- First full CTA science operations horizon still beyond typical university education timescales. Need to conserve expertise and provide continuity in education!
- Lingering hard physics questions still unanswered: Acceleration mechanisms, CR luminosity
- Multi – messenger astronomy picking up tremendous speed: Gravitational waves & IceCube neutrinos
- Strong motivation for near-instantaneous observation capability

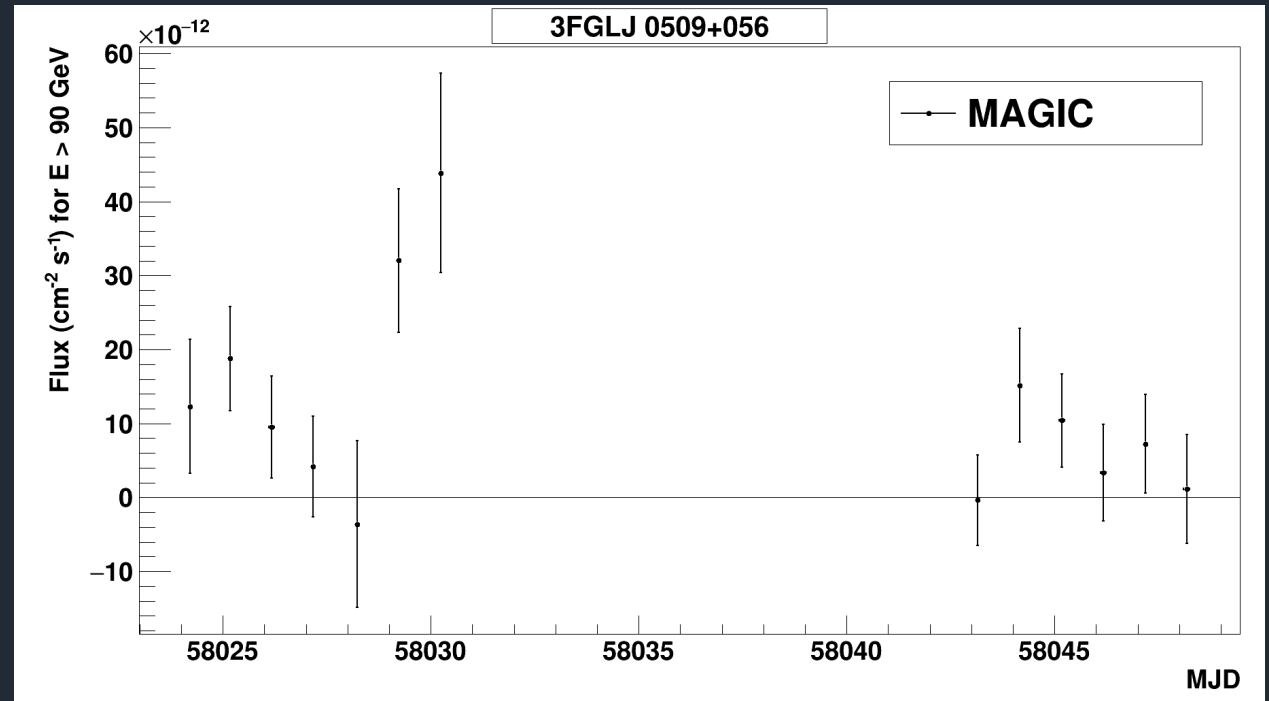
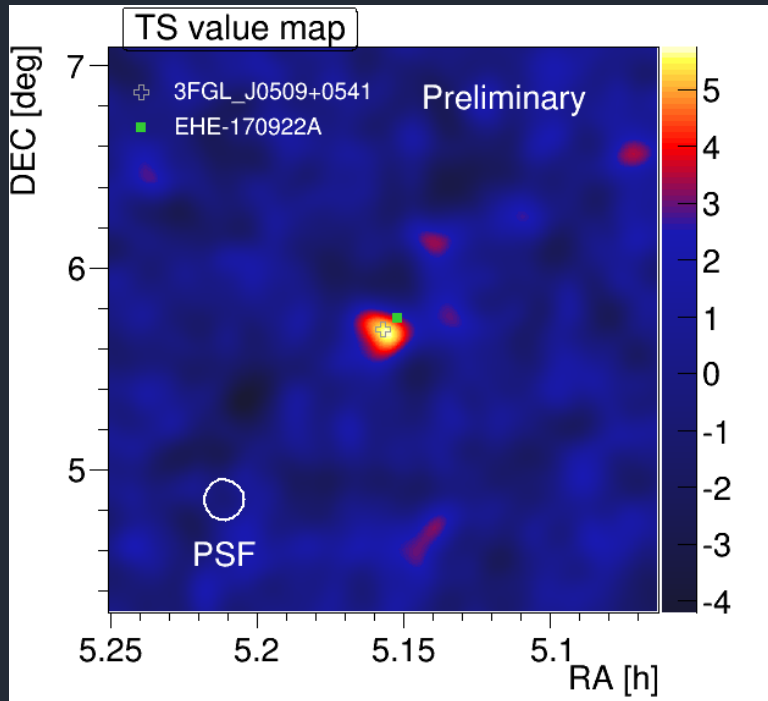
FACT: A highly successful technology & methods pioneer



FACT achievements towards future instruments

- Suitability of SiPM – cameras for dense monitoring of sources even under difficult conditions
- Demonstrated reliability, robotic operations!
- Public data set: <https://fact-project.org/data/>
- High – performance public analysis software developed by the Dortmund group:
<https://github.com/fact-project/fact-tools>

TXS 0506: Harbinger of the neutrino point – source era



What can we do NOW to preserve & greatly expand VHE monitoring & follow – up capabilities worldwide?

Proposal

Three pillars:

A) Preserve, maintain and upgrade existing facilities well into the CTA era

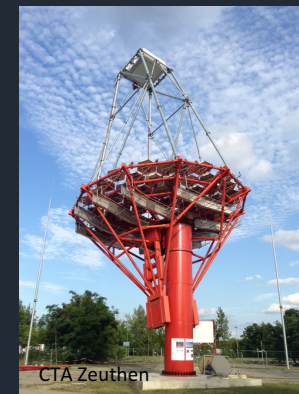
B) Build upon the expertise gained from prototypes & precursor experiments (FACT, but also the CTA prototypes)

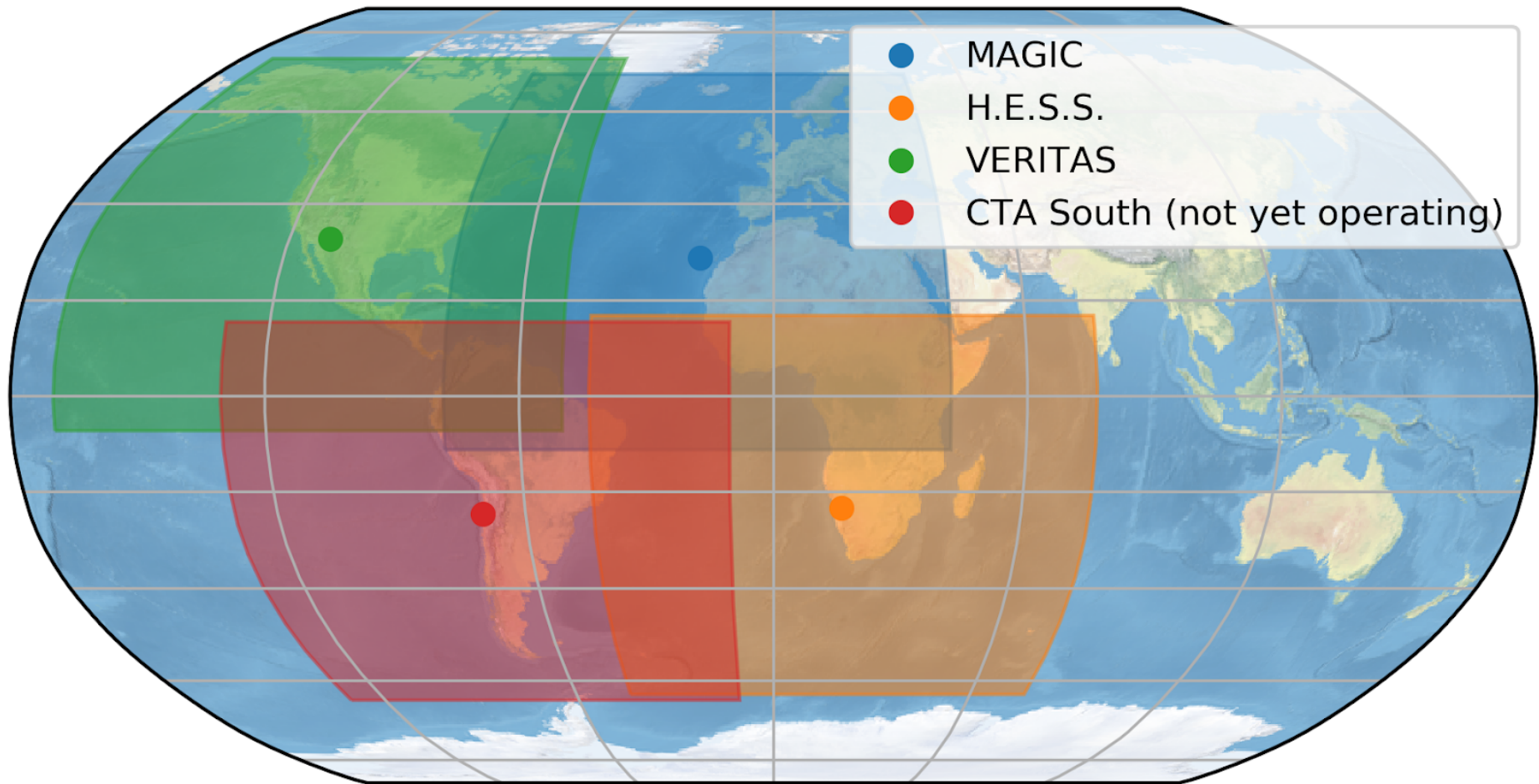
C) Form group of international partners to complete a ring of IACT facilities covering a wide range of longitudes and latitudes:

Cherenkov Telescope Ring

Goal

- Achieve few percent Crab flux sensitivity above $\sim 150\text{GeV}$ per site
- This will open up the Universe out to $z \sim 1$, including amongst others the VHE - detected FSRQ population
- Baseline telescope can be “MST - like”, meaning $\sim 90\text{sqm}$ mirror area, modular camera with state-of-the-art readout and SiPM sensors.
Projected price tag per site 350k – 500k Euros

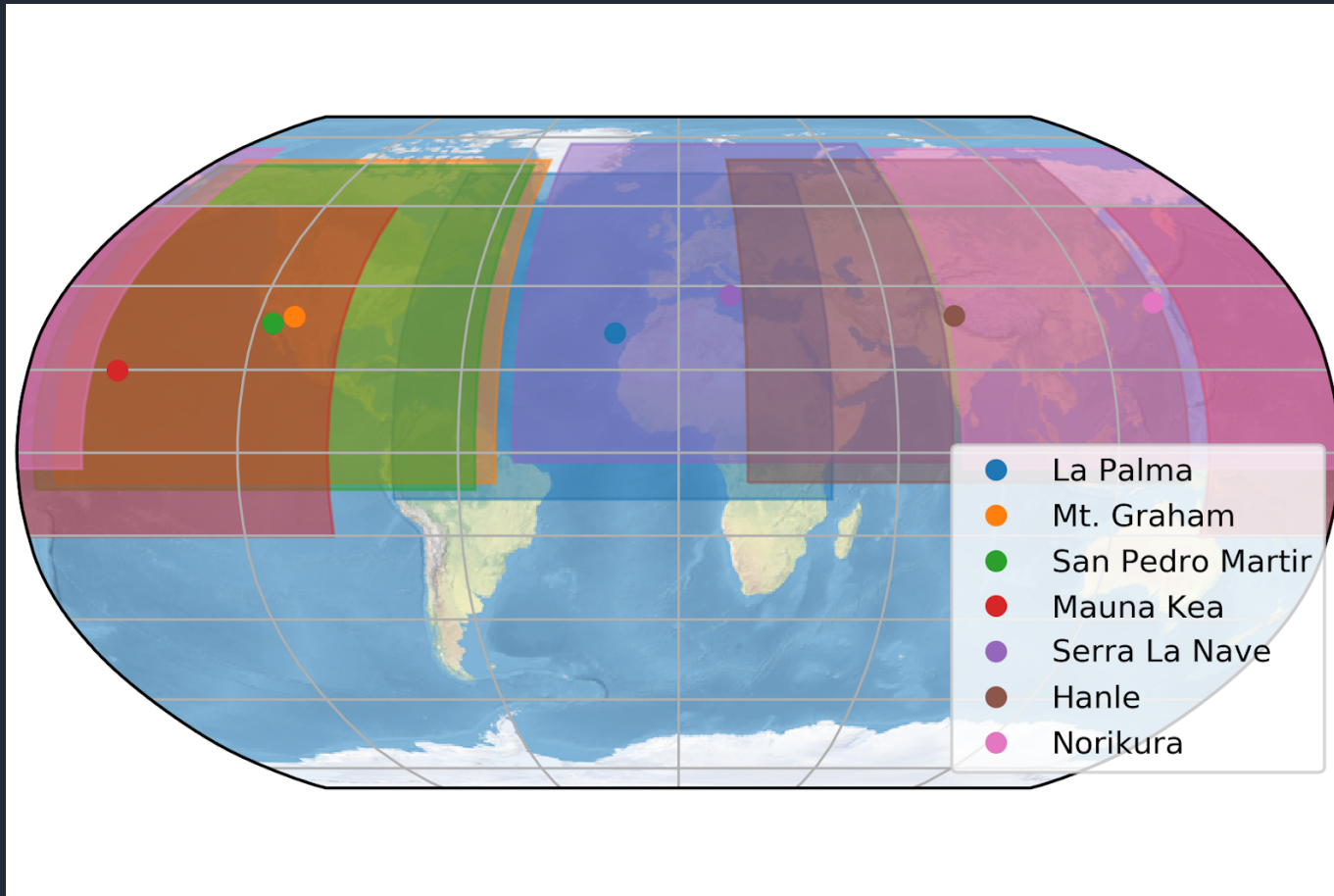


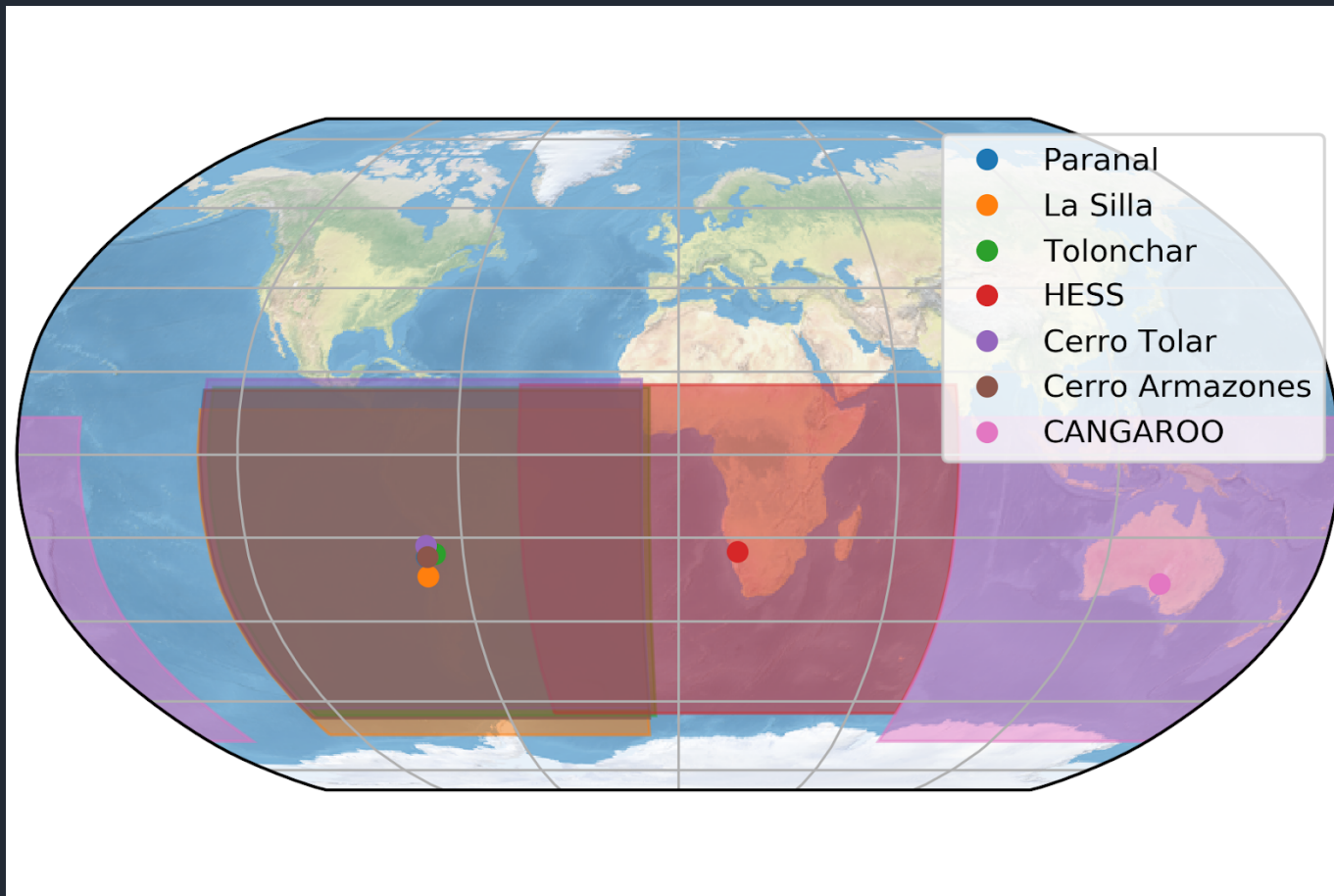


Key Point: CTR is not meant to compete with CTA, but to “bridge the gap” in a temporal sense, pertaining equally to construction timescales and observational coverage.

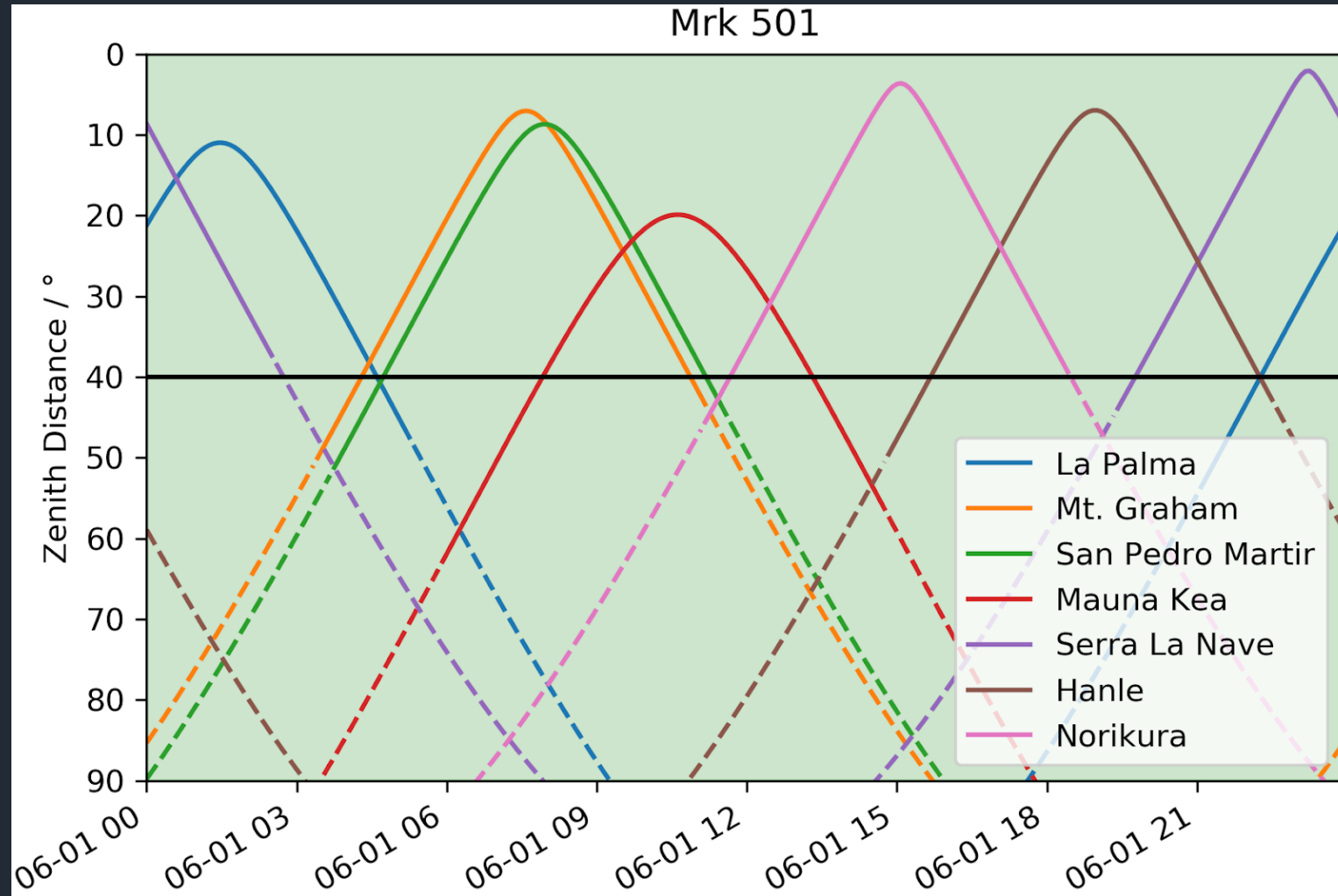
→ CTA will provide deep coverage and wide energy range, while CTR can complement time series

→ CTR can provide alerts to CTA





Continuous monitoring



Summary

- Strong physics motivation for expanded world – wide monitoring capability
- Can be achieved with realistic efforts now by building upon existing facilities & expertise from pioneering instruments (CTA, FACT, et al.)
- Additional motivation: technological and educational continuity into the CTA era
- Lake Baikal site, potentially in connection with TeV – array, would add substantially to the science capabilities!