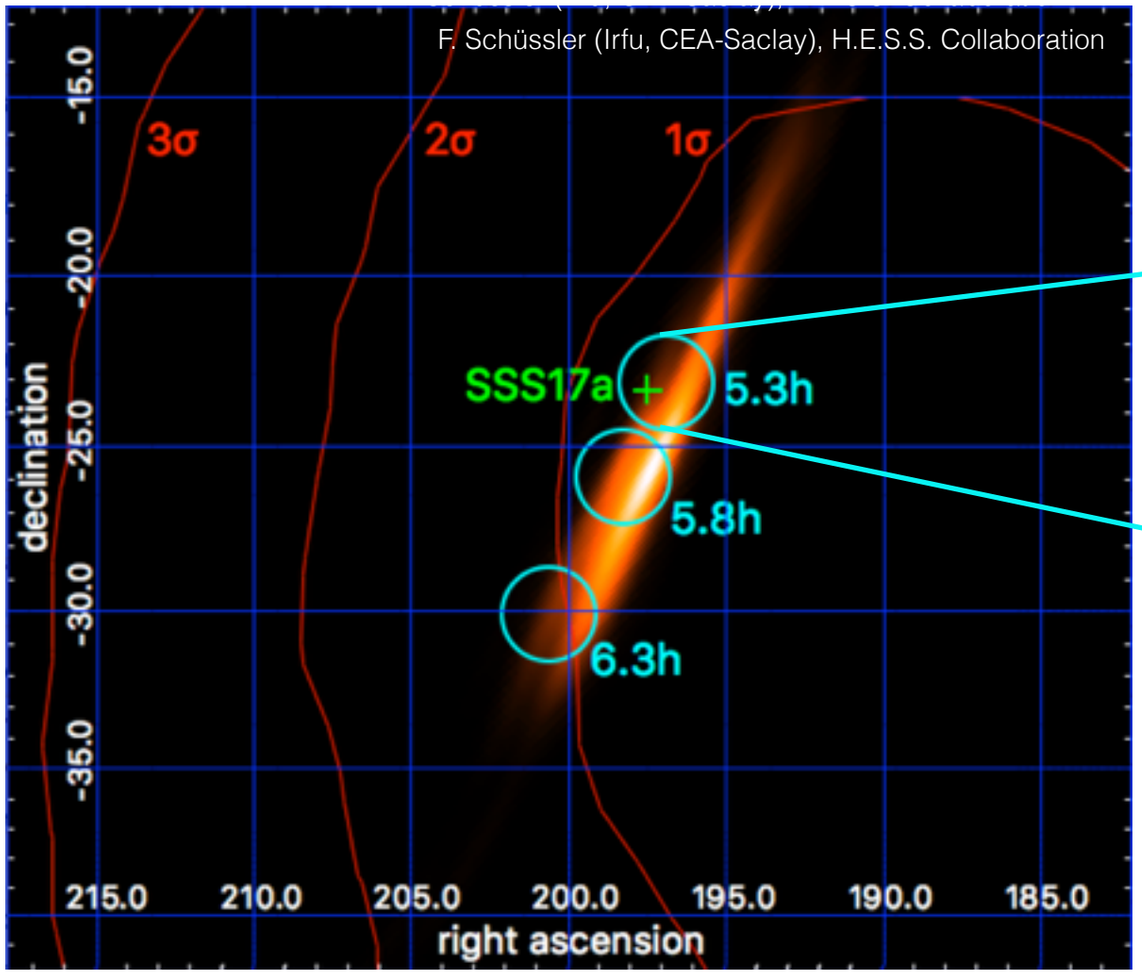
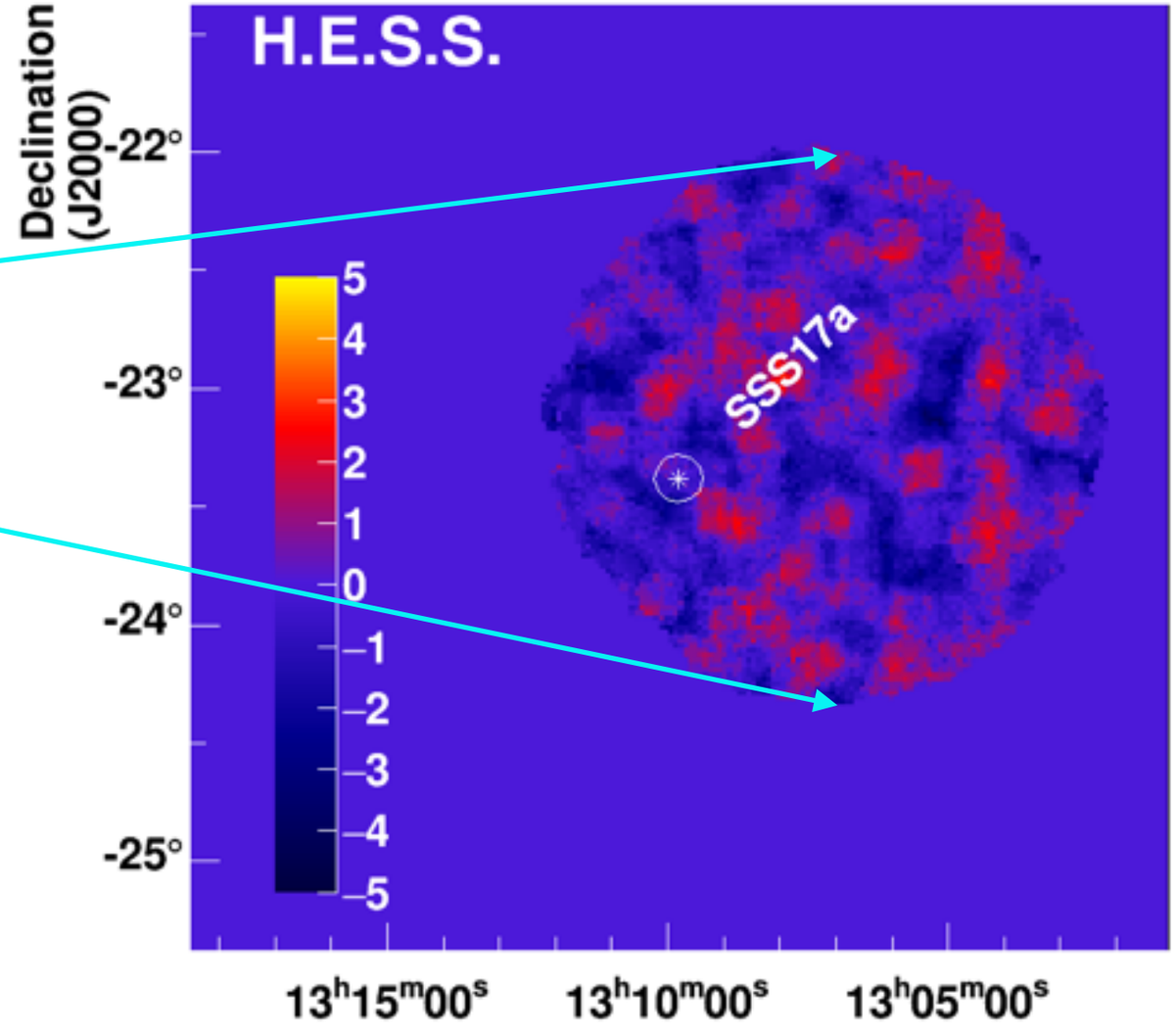
GW170817

Animation: NASA's Goddard Space Flight Center

H.E.S.S. observations of GW170817

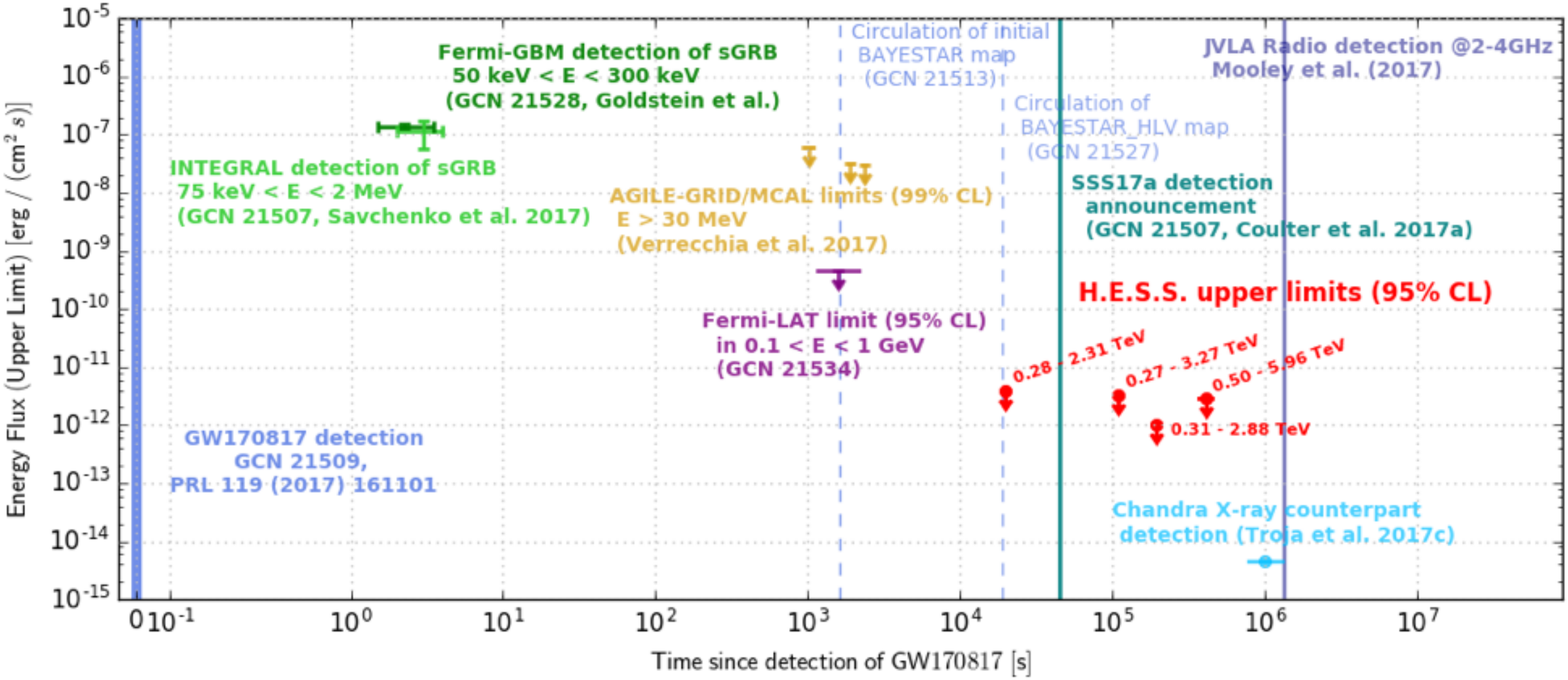




- First observations of a ground-based pointing instrument
  - 5.3 hours after GW170817
  - 5 minutes after the GCN circular announcing the Ligo+Virgo analysis
  - no significant signal: $\Phi\ (0.28 < E\ [\mathrm{TeV}] < 2.31) < 3.9 \times 10^{-12}$ erg cm^{-2} s^{-1}

ApJL 850 (2017) L22, arXiv: 1710.05862

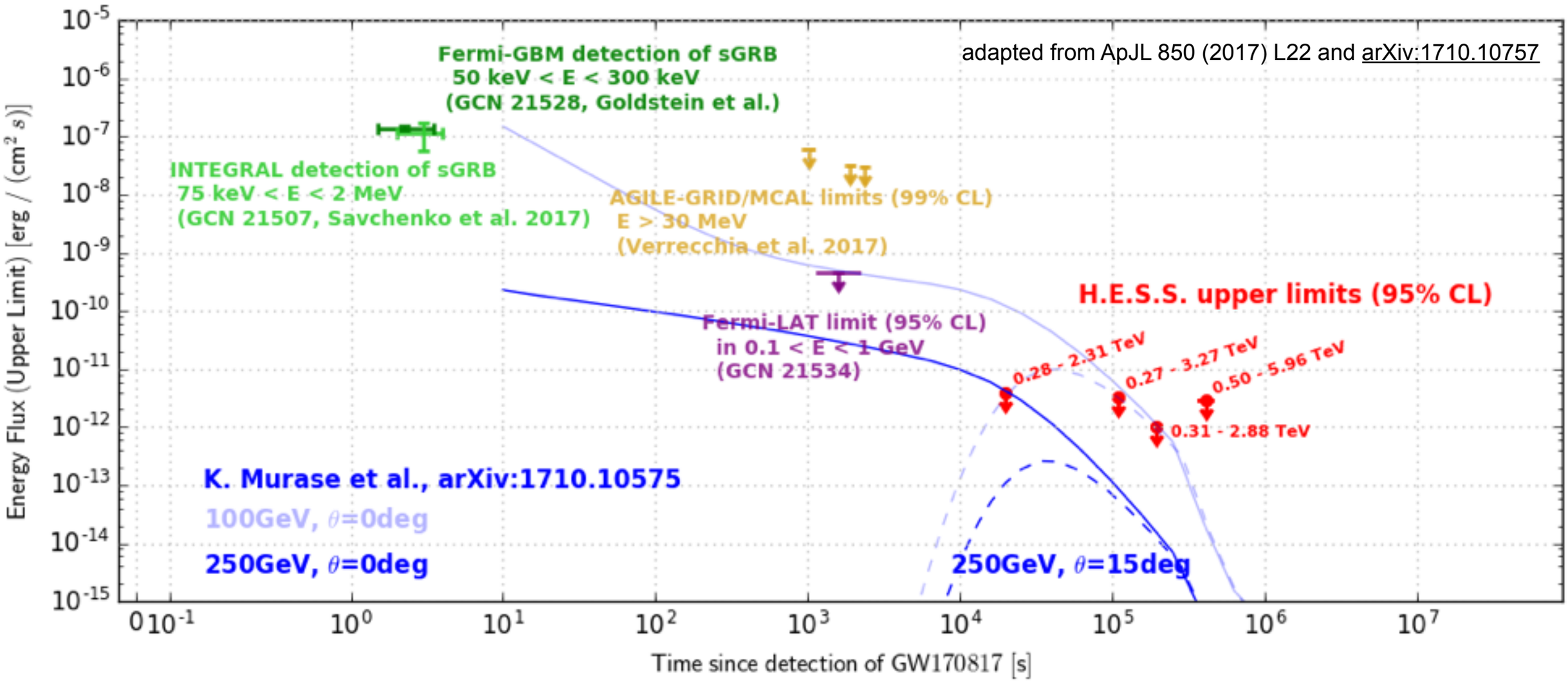
H.E.S.S. observations of GW170817



- Rapid follow-up observations
- Extended follow-up campaign over ~5 days

ApJL 850 (2017) L22, arXiv: 1710.05862

H.E.S.S. observations of GW170817



- Rapid follow-up observations
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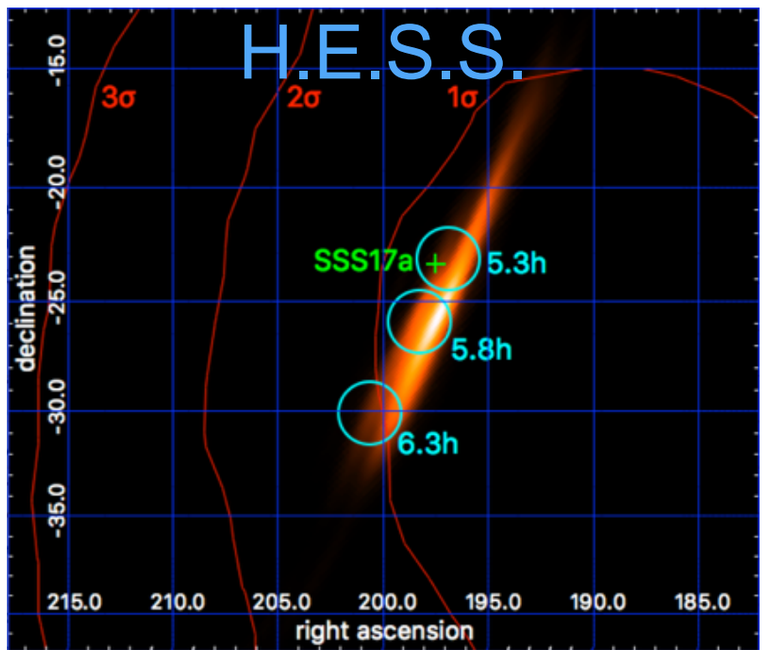
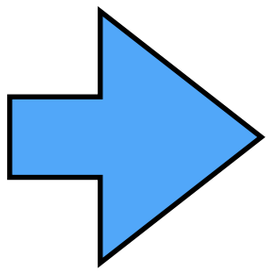
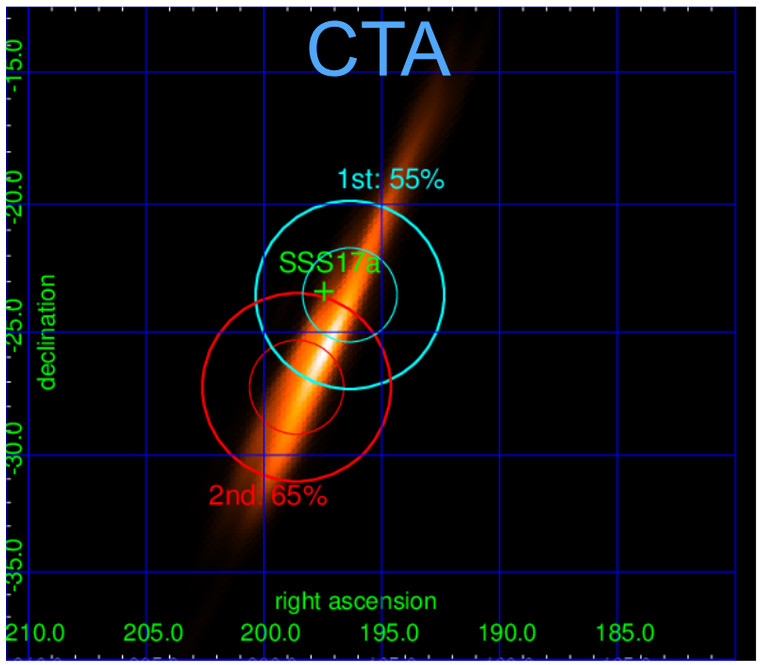
GW170817: Cherenkov Telescope Array

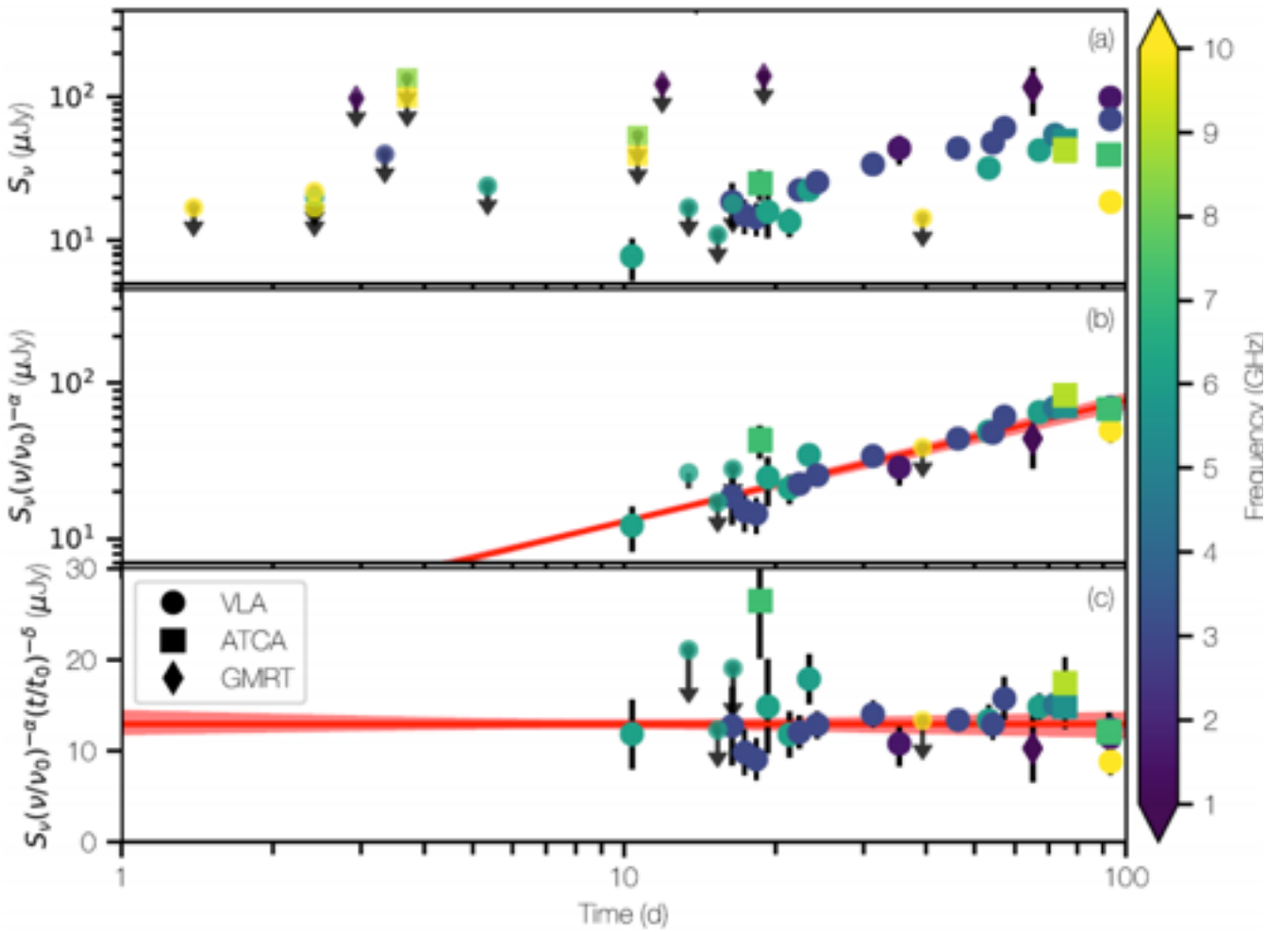


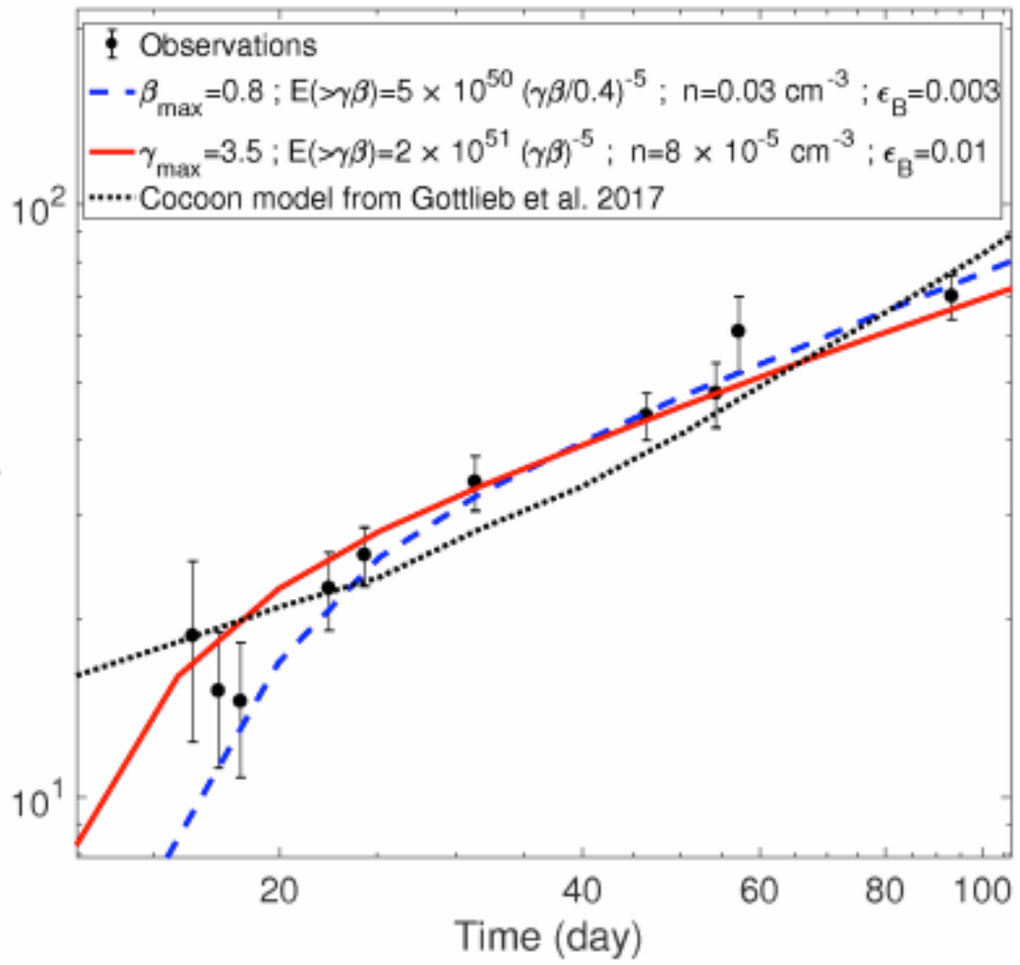




GW (and sGRBs): current discussions

- covering **extended** periods of time instead of focus on prompt emission (!?!)
  - delayed non-thermal emission (e.g. X-ray emission of GW170817)
  - very late emission (e.g. rising radio flux of GW170817)

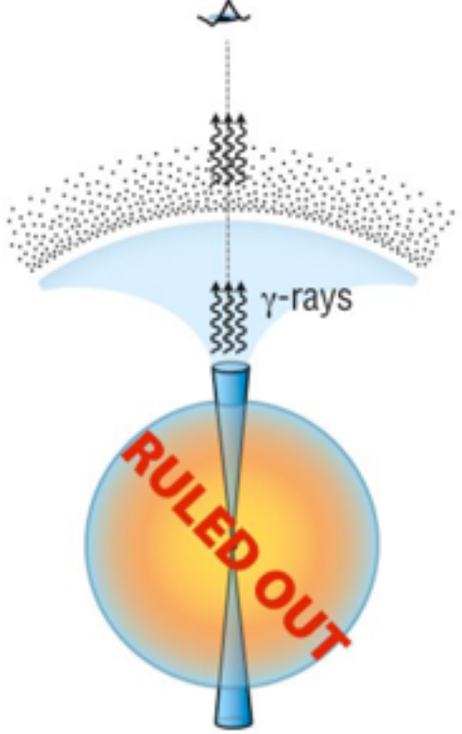




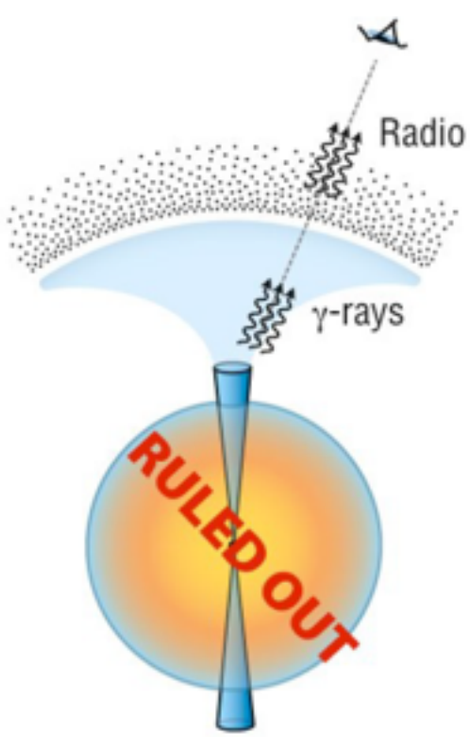
K.P. Mooley, arXiv:1711.11573

GW170817: scenarios

- typical sGRB with on-axis or off-axis jet
  - not able to explain the late and continued rise of the radio emission

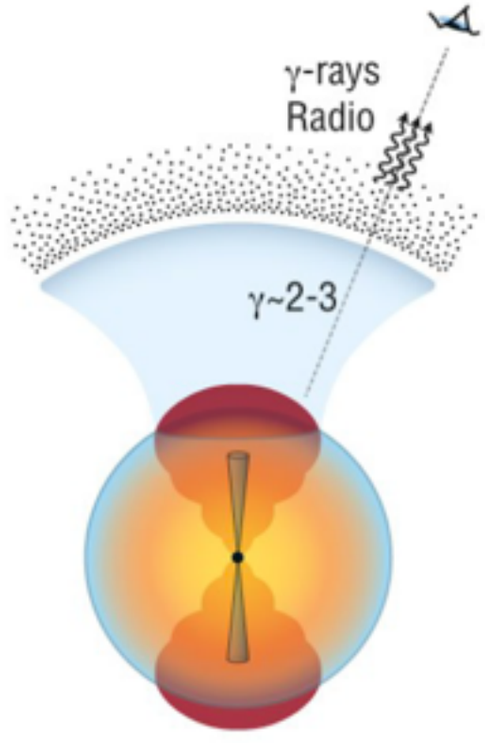


A. On-axis Jet
SGRB and afterglow



B. Off-axis Jet
SGRB and afterglow

- favored scenario: chocked jet + mildly relativistic cocoon
  - VHE emission unlikely, but who knows?



C. Choked Jet
Cocoon γ-rays and afterglow

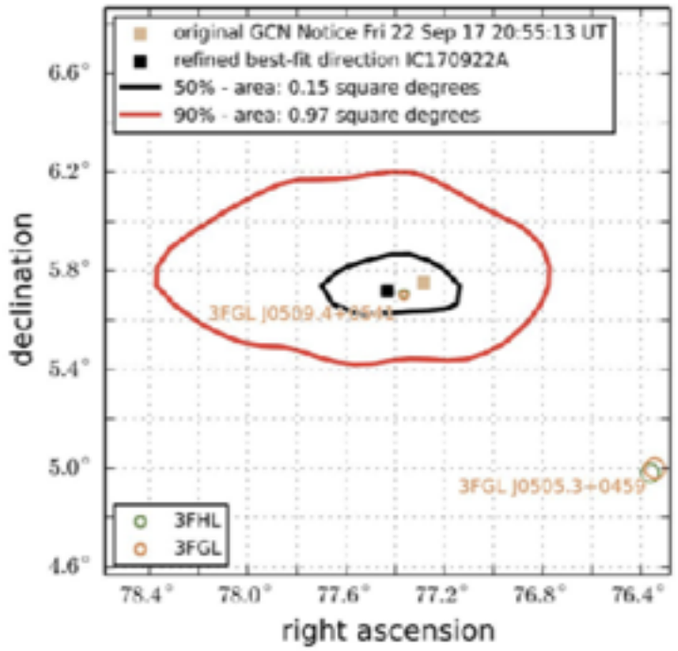
M.M. Kasliwal, Science 2017 and K.P. Mooley, arXiv:1711.11573

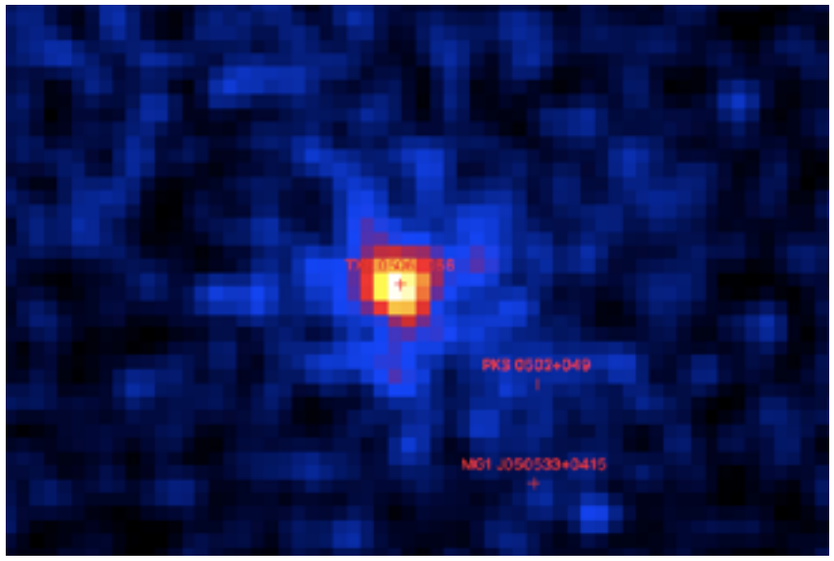
GW follow-up with SGSO

- First multi-messenger observations of a NS-NS merger
  - GW + sGRB + kilonova
- GW follow-up highest priority in CTA Transient Key Science Project
  - SGSO: same visibility but much larger duty-cycle
  - large uncertainty GW events (less and less likely, KAGRA starting 2020/2021)
  - low-significance events, sub-threshold combined searches, etc.
- GW170817: long-term and increasing radio and X-ray
  - new input to emission models
  - …

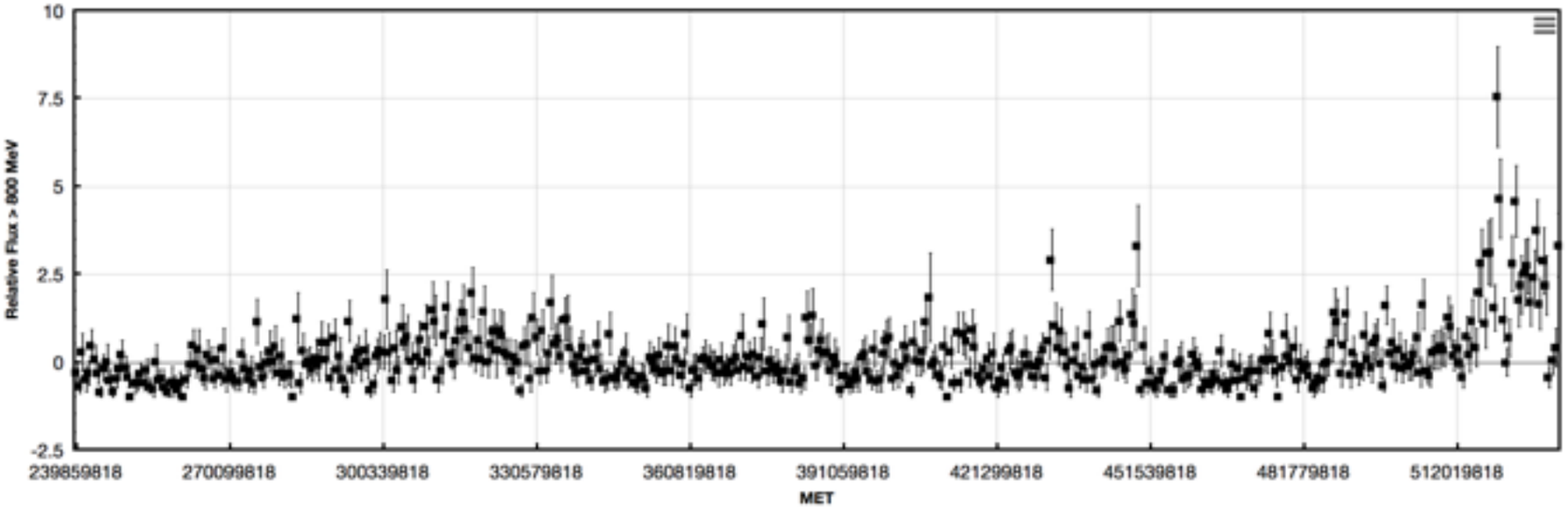
High-energy neutrinos

- detection of a EHE IceCube neutrino in coincidence with a flaring blazar
- sky monitoring with low-energy + high sensitivity observatory
- this event: flare timescales days-weeks



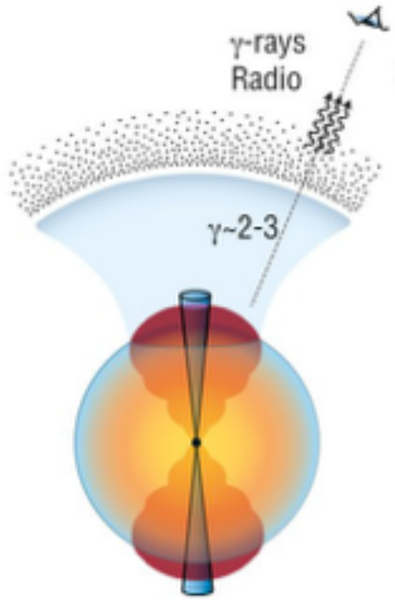


MAGIC: 5sigma after 12h
no detection from VERITAS+H.E.S.S.



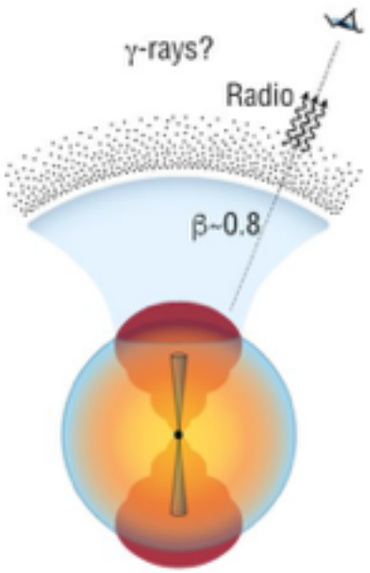
GW170817: scenarios (II)

- cocoon outshines successful jet
  - comparable energies should create visible jet



D. Successful hidden Jet
Cocoon γ-rays and afterglow
(less likely)

- choked jet + cocoon with slow ejecta
  - cannot explain gamma ray emission



E. Choked Jet
Fast ejecta afterglow
(less likely)

M.M. Kasliwal, Science 2017 and K.P. Mooley, arXiv:1711.11573