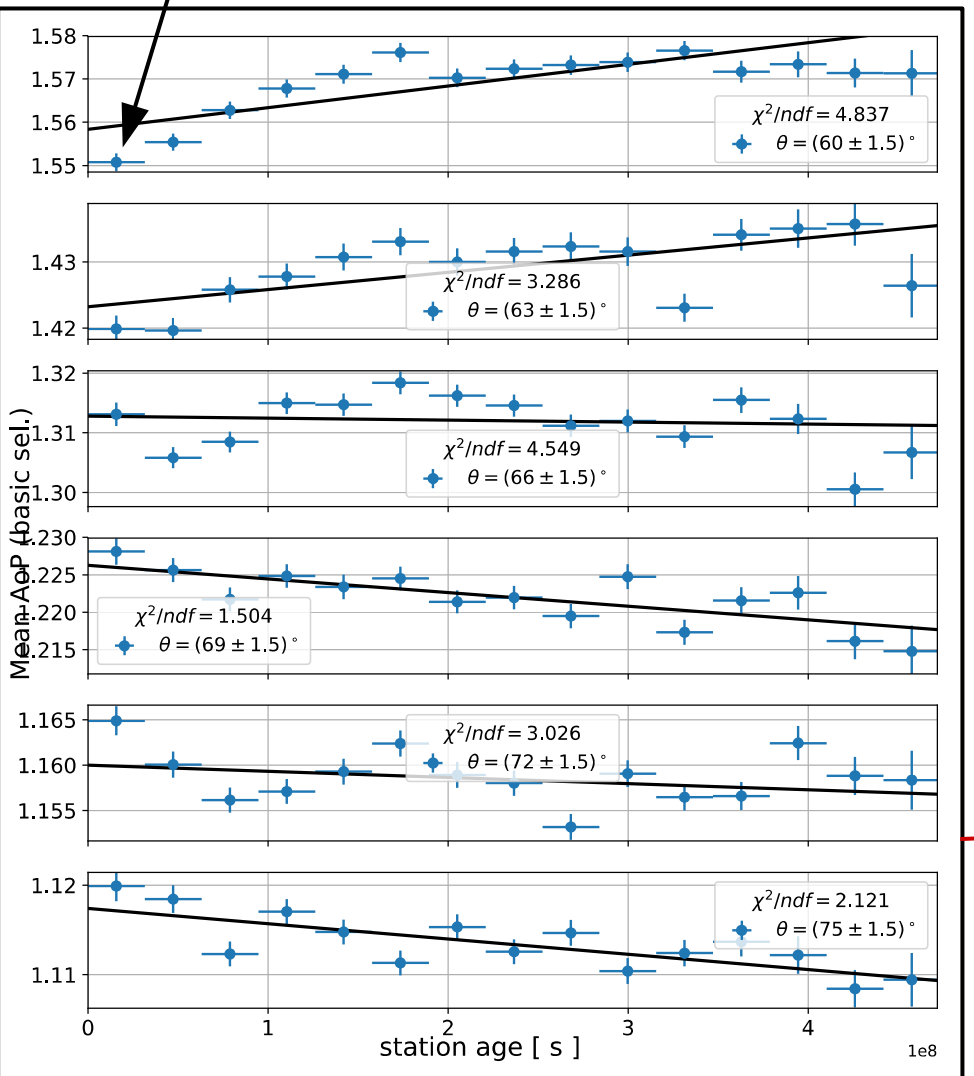
Evolution of calibrated AoP (A/P) from air showers

Michael Schimp, BUW, 2019 Jul 11

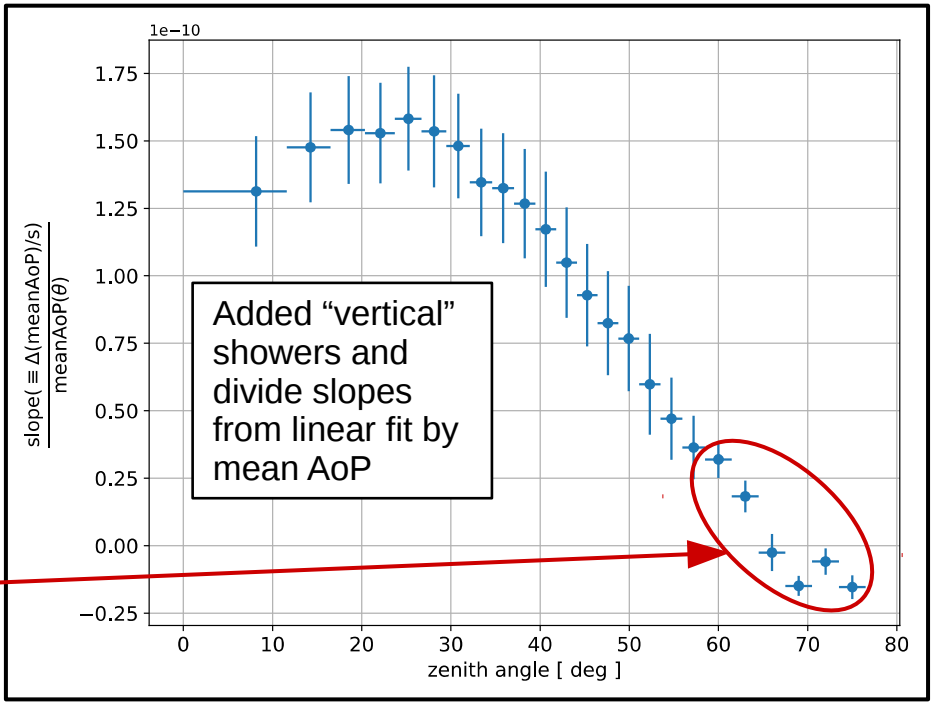
Recap

From 0 to ~1 years after deployment, stations measure this mean AoP for showers with θ = 60 +- 1.5 deg



Very basic event selection:
Removed bad PMTs, stations with saturated PMT, bad periods

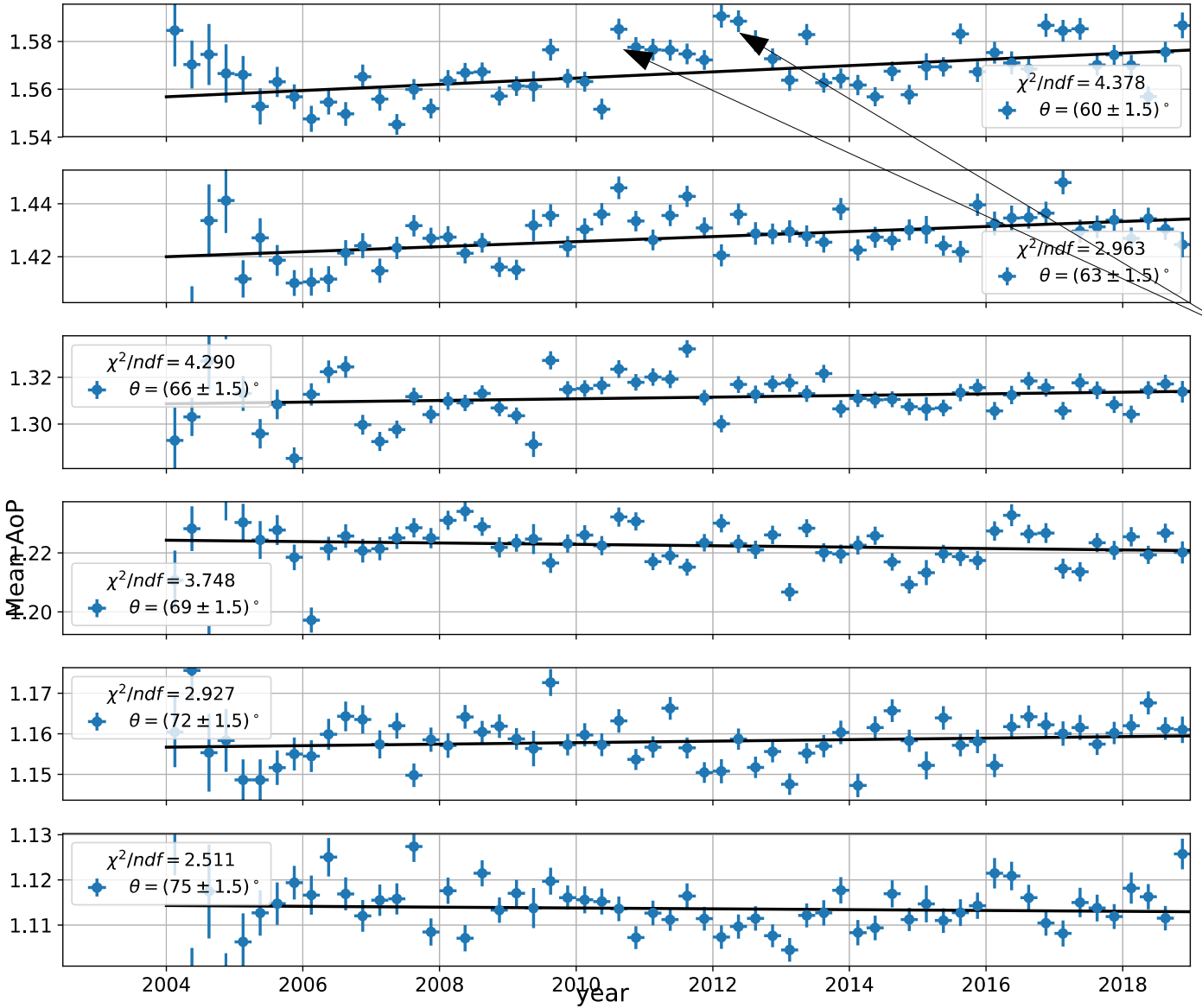
Top down signal selection, direct light removal



Further procedure, what to look at

Suggestions from the last calls:

- AoP vs time instead of age → then, instead of whole years, look at seasons

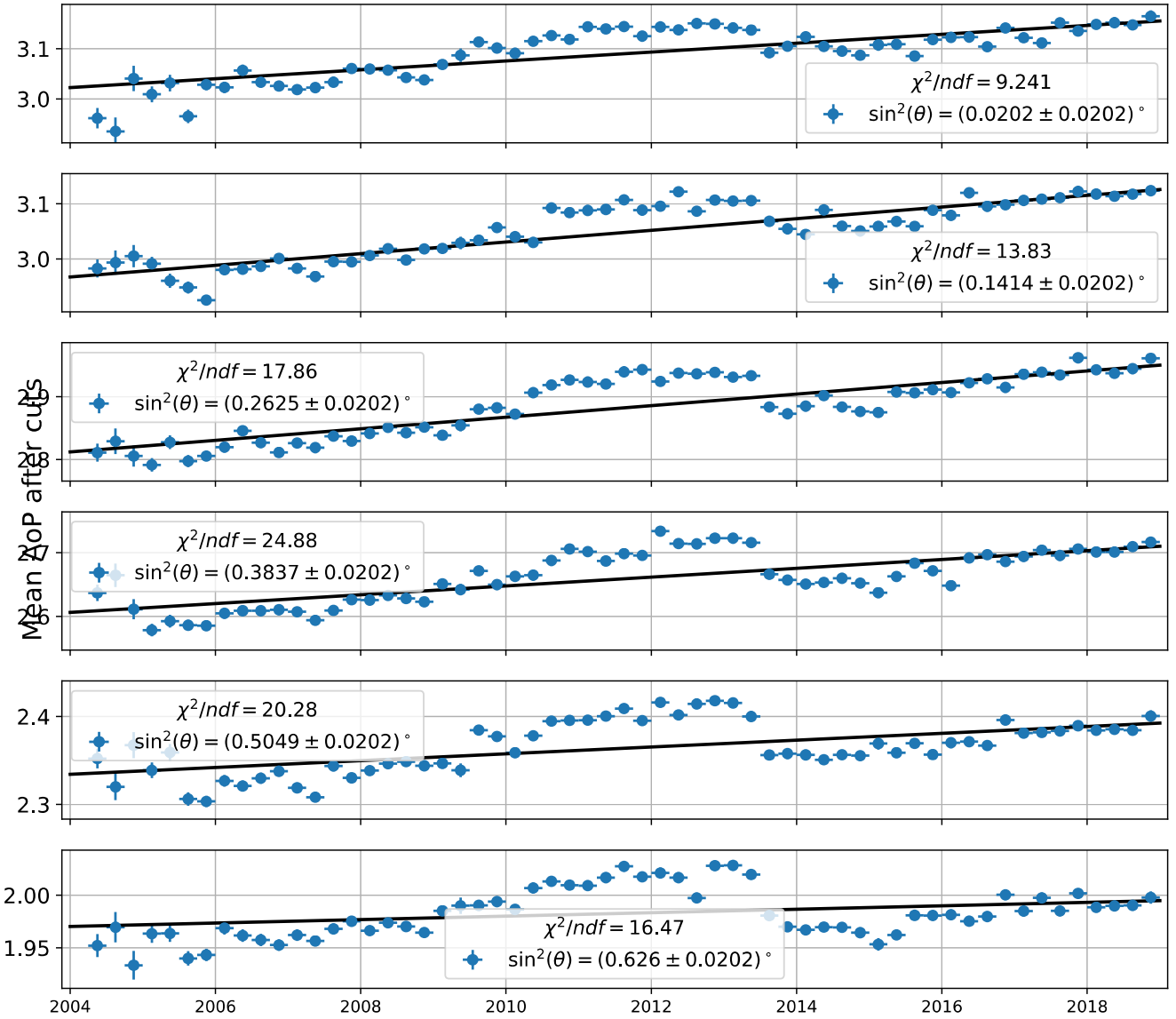


58.5..76.5 deg

No obvious season-related trends

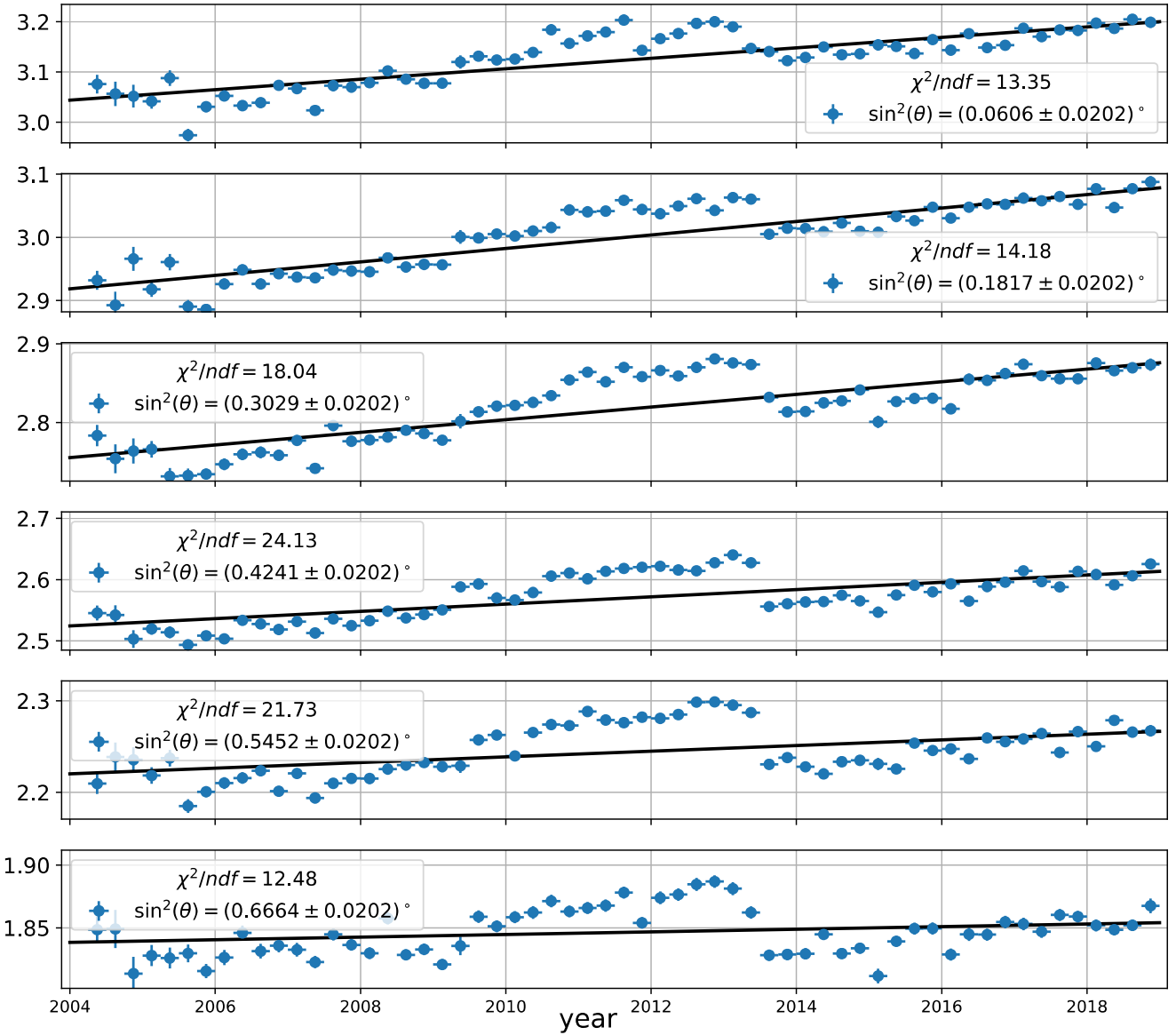
Need further analysis → e.g. short-term causes for sudden jumps?
(One starting at Jan, one at Jul)

Corresponding plot for theta < 60 deg on the next slides



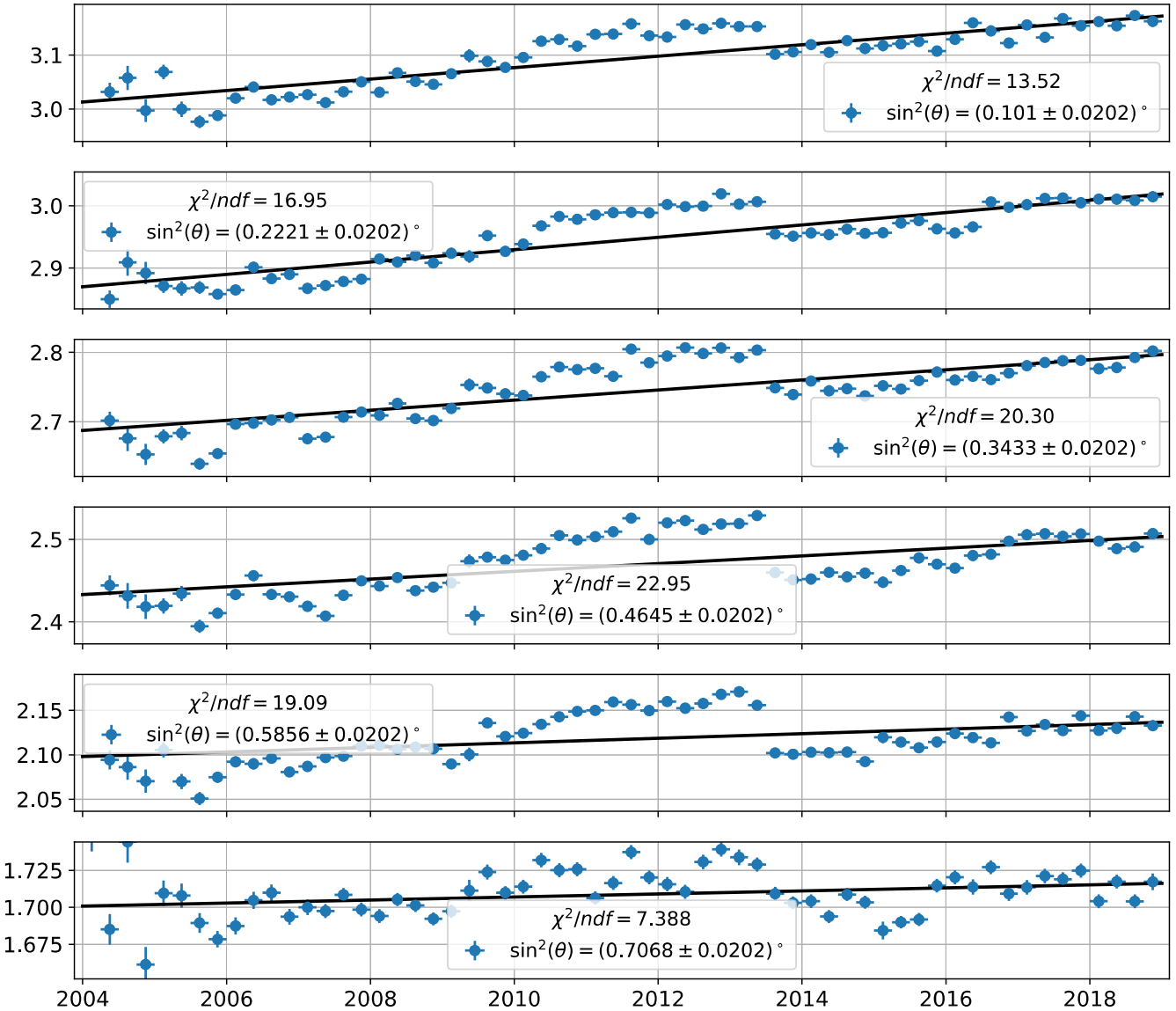
First 6 angular bins from plot on slide 2

(0..~30 deg)



Second 6 angular bins from plot on slide 2

(~30..~45 deg)



Third 6 angular bins from plot on slide 2

(~45..~58.5 deg)

Further procedure, what to look at

Suggestions from the last calls:

- AoP vs time instead of age → then, instead of whole years, look at seasons
- Split data by signal strength → Plot everything **separately** for stations with low/high signal (sum(VEM)? Bias?)
- Look at area and peak **separately** to see what dominates the effect
  - Definition of area and peak of a station in the DGL neutrino search (which is how the AoP is calculated; division by the n_{PMTs} is omitted here):

VEM trace

$$\text{Peak} = \sum_{\text{PMT}} \max(\text{VEM}_{\text{PMT}})$$

$$\text{Area} = \sum_{\text{PMT}} \sum_{i} \text{VEM}_{i,\text{PMT}} \cdot \frac{\text{CalibPeak}_{\text{PMT}}}{\text{CalibCharge}_{\text{PMT}}}$$

*i*th bin in of the VEM trace

  - Options:
    - Take “Peak” and “Area” as written here in the eqns
    - Ignore the calib constants for “Area”, and look at both of their evolutions separately as well
    - Go to the PMT level and look at each VEM trace of the PMTs, and the calib constants separately