

122 stations  
 9 selected: fit bias + 2<sup>nd</sup>/4<sup>th</sup> order  
 MIM

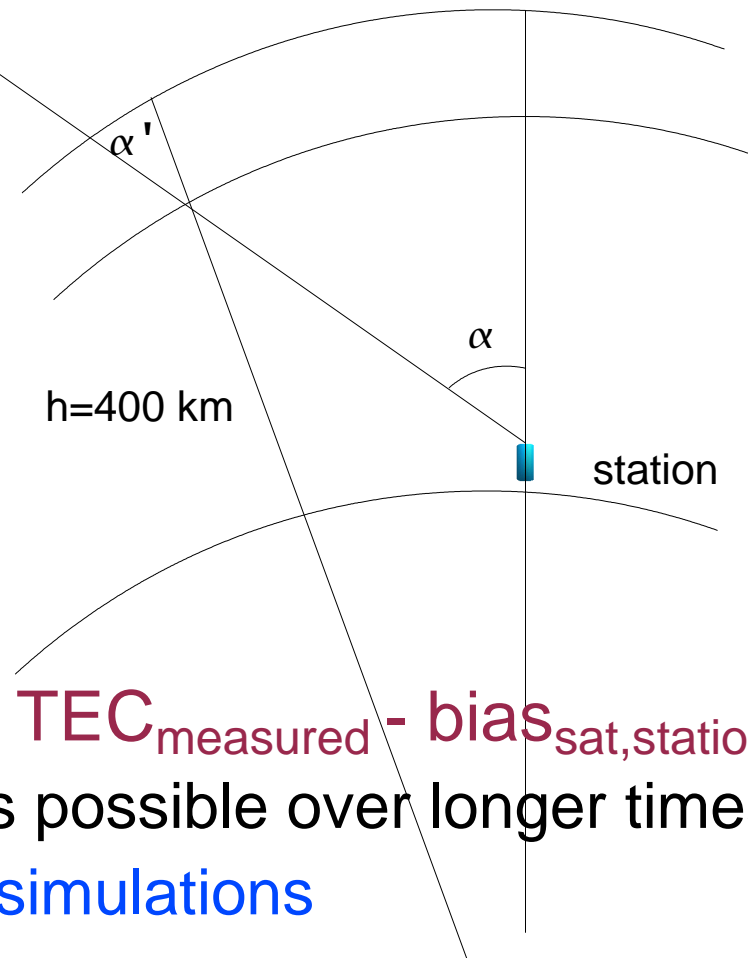
fix MIM + fit bias for all stations

# Piercing Points

satellite



spherical earth assumed  
 $1/\cos(\alpha')$  correction  
for thickness ionosphere  
fixed  $h$  at 400 km  
cut at  $\alpha > 60^\circ$

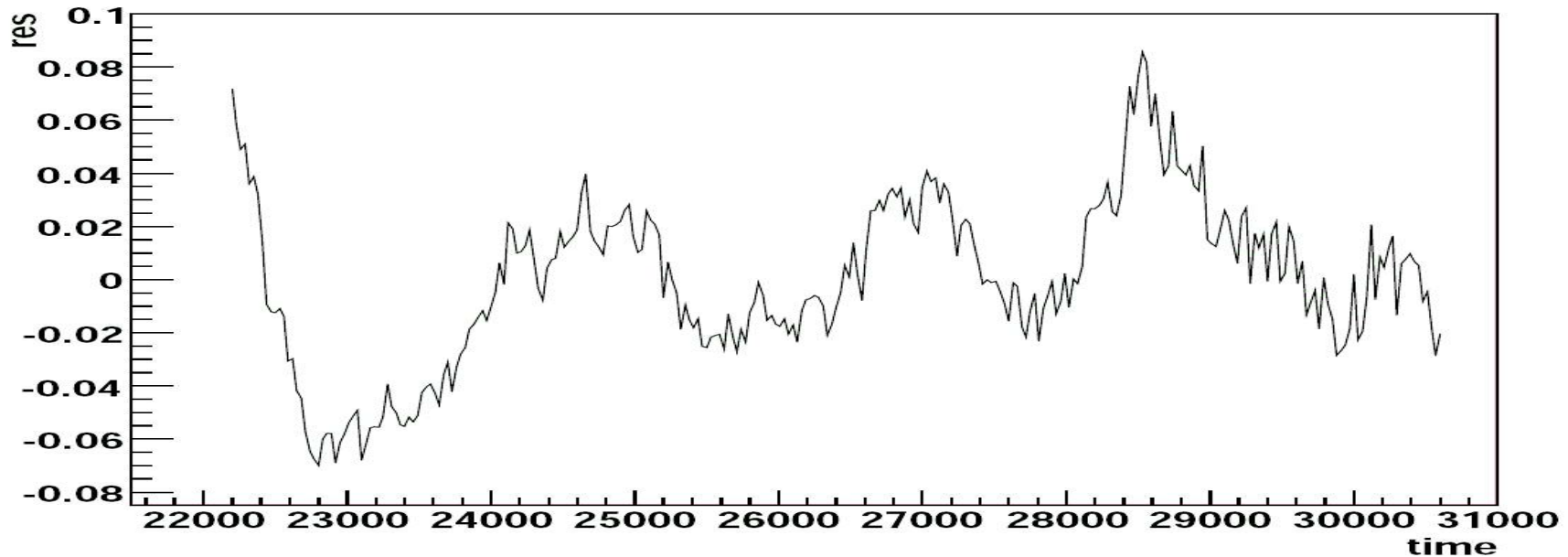


$$\text{Residuals} = \text{MIM}(t) \cdot 1/\cos(\alpha'(t)) - \text{TEC}_{\text{measured}} - \text{bias}_{\text{sat,station}}$$

simultaneous fit of MIM + bias possible over longer times

principle proved by MeqTree simulations

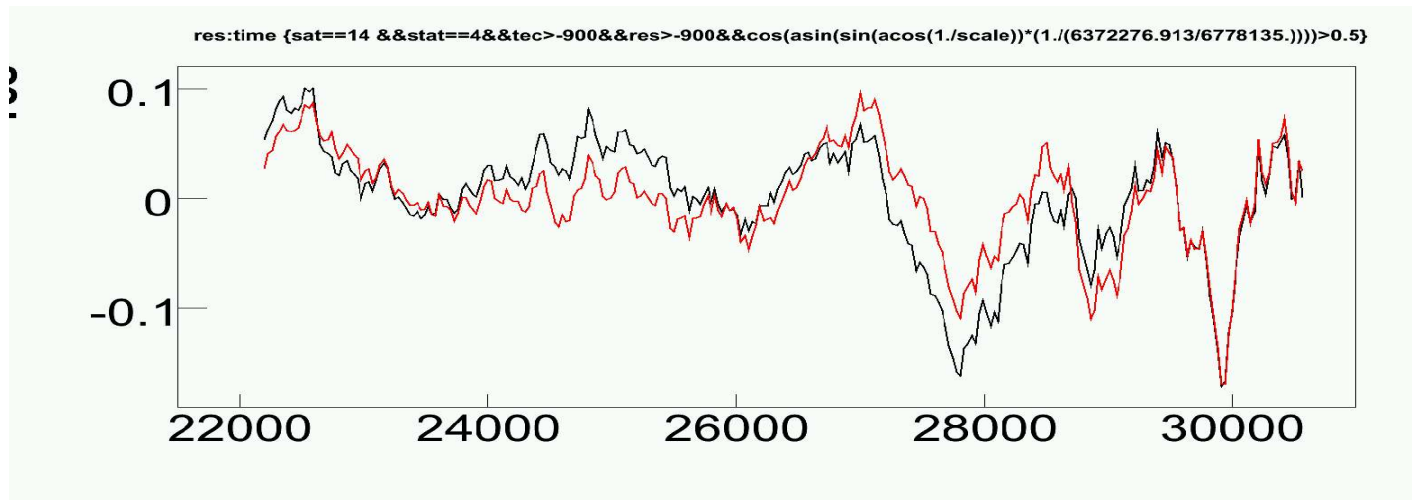
# Residuals



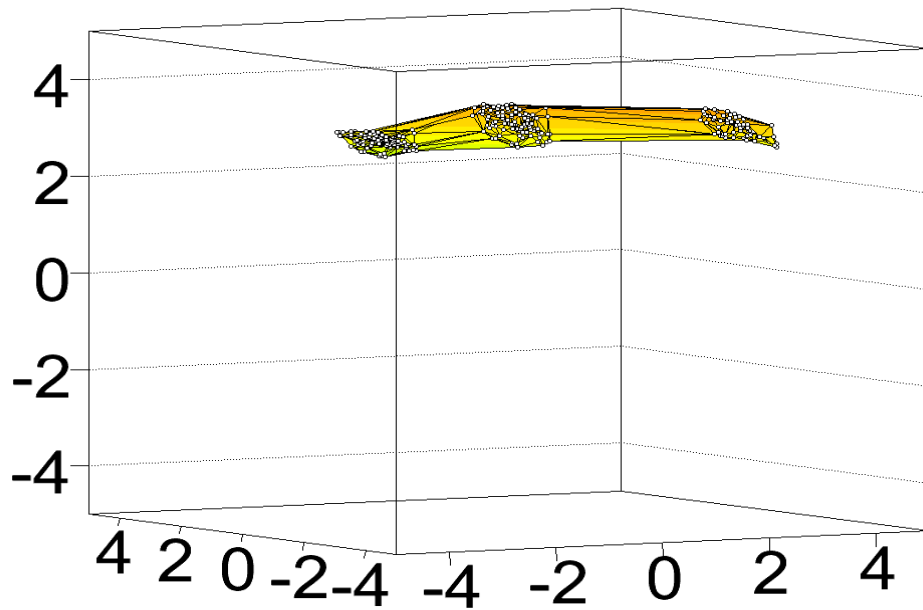
small scale fluctuations  $\sim 0.01$  TEC

large scale fluctuations  $\sim 0.1$  TEC : MODEL?

difference between  
2<sup>nd</sup> and 4<sup>th</sup> order  
MIM fit



## frames

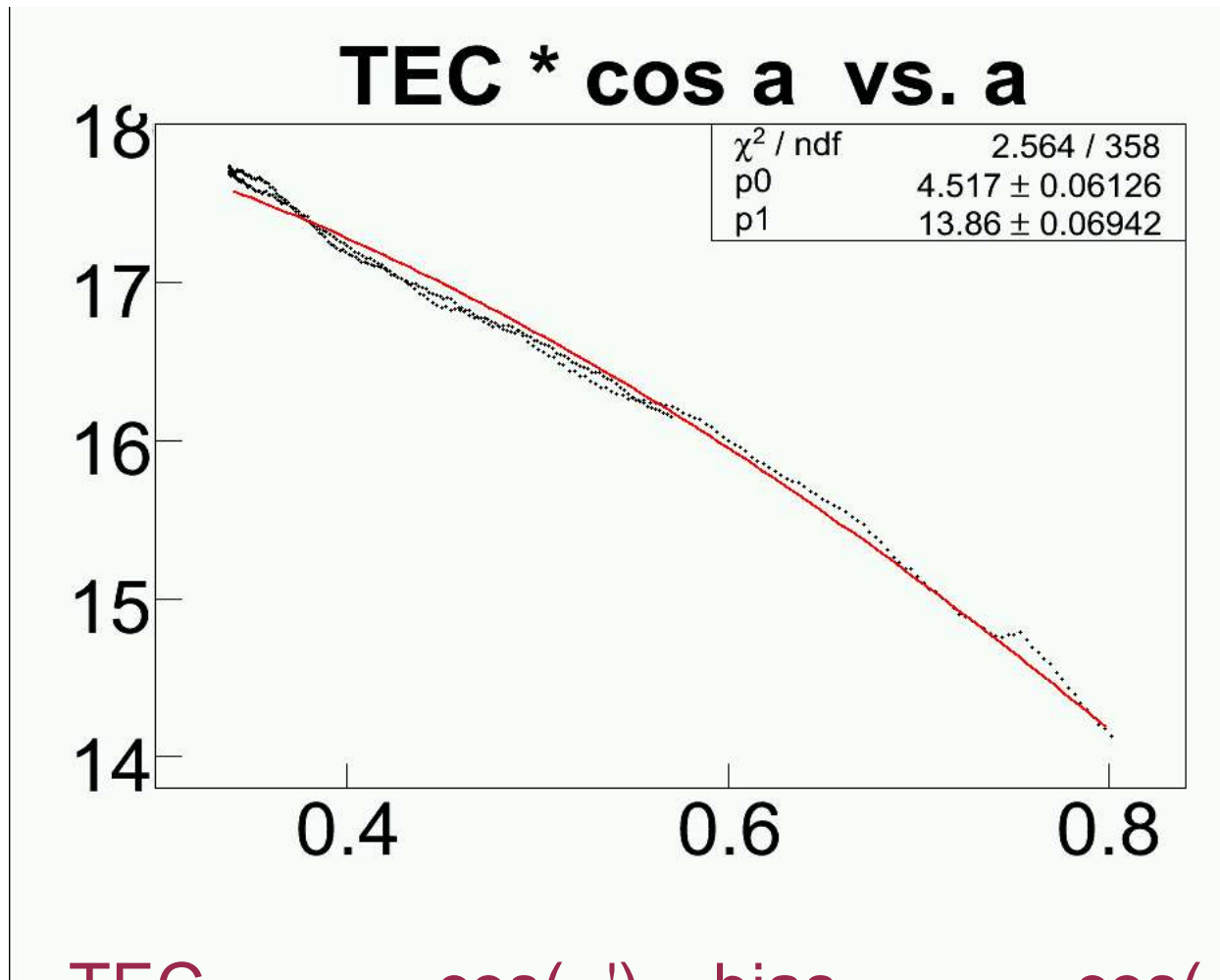


Visualize what is going on  
 $(\text{TEC}_{\text{meas}} - \text{bias}) * \cos(\alpha)$  vs. time  
Negative values!

Solution very sensitive to input:  
eg. 3 hour fit/ 2x 1.5 hour fit  
residuals about the same (0.1 TEC)

difficult to separate bias from MIM

## Investigate Bias at track level



$$\text{TEC}_{\text{measured}} \cdot \cos(\alpha') = \text{bias}_{\text{sat,station}} \cdot \cos(\alpha') + \text{TEC}(t)$$

$$\text{FIT: } p0 + p1 \cdot \cos(\alpha')$$

From MeqTree fit: Bias = 14.1