

## Questions related to advances in atmosphere delay estimation

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Should we continue to separate hydrostatic and wet for modeling and estimation?  
(I don't have an alternative.)

1. What is desired?

Accurate model of delay variation as function of elevation, azimuth, and time that is scaled to a few estimable parameters, such as zenith (wet) delay (ZWD) and gradient direction and magnitude (or North and East magnitudes).

This is first order expansion. Do the data support higher order terms?

how low in elevation must observations go to need higher order terms?

are systematic errors small enough to obtain meaningful atmosphere estimates?

How important is the model for the time variability?

e.g. piece-wise linear or stochastic

time-scale for variability: Zenith delay? Gradients?

2. Where do we get the input?

Is there any alternative to a Numerical Weather Model?

**Is a prediction accurate enough for Near Real Time estimation and orbits?**

**How much in advance?** (this influences computation time and storage)

3. How can the NWM be used?

Raytrace vertical profiles to get mapping function directly (Rocken et al)

Extract parameters and calculate mapping function (Niell)

Symmetric mapping function only?

Hydrostatic?

Wet?

Symmetric and gradient mapping functions?

Hydrostatic?

Wet?

What are the advantages of each?

Accuracy

Calculation time

Storage requirement (file sizes)

Correction for topography (height relative to NWM reference height)

How do NWMs differ (e.g. JMA, NCEP, ECMWF)?

Accuracy

Climate vs forecast

Pressure levels

Horizontal resolution

Prediction vs analysis

What horizontal resolution is needed?

Hydrostatic

Wet