Thermal Soaring Forecasts

"Dr. Jack" Glendening

DrJack Products

for THERMAL soaring parameters

- **BLIPMAP**
  gives parameters over an area for single time
  updated graphical product available via internet
- **BLIP**
  gives parameters at a point for different times
  essentially same parameters as BLIPMAP
  updated text product available via internet
- **TIP**
  gives parameters at a point for different days
  older technique, except ETA BLIPMAP to superceed
  one-in-the-morning text product sent by email

BOUNDARY
LAYER
INFORMATION
PREDICTION
MAP

BOUNDARY LAYER (BL)

Region affected by surface mixing/turbulence

In convective conditions, region created by thermals

Top of the BL = Top of thermals

(with max. thermalling height somewhat below that)

SCALE

Size of an atmospheric phenomenon

Model can only predict scales it can resolve

In general.
prediction precision more difficult as scale decreases

however: phenomena created by topography
are better predicted as topo becomes better resolved

BLIPMAP BASICS

Website: www.drjack.net/BLIPMAP

Lots of info and links on that page

but all not equally important

I do expect user to have read basic info on that page once

Good first read: link to my SOARING article

14 thermal soaring parameters predicted

but not all equally important

So start with just one or two parameters at a single time

Add more later as needed

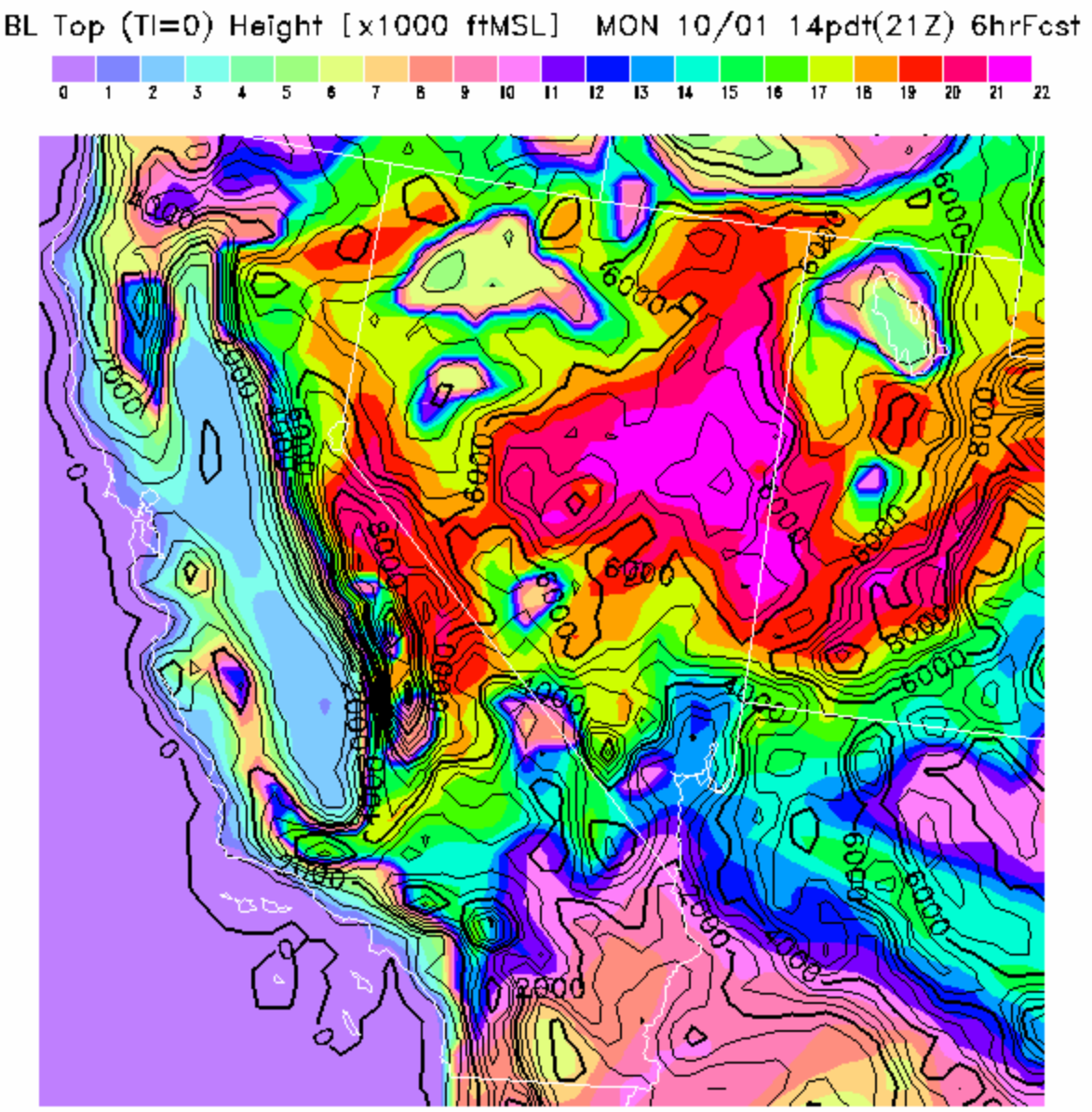
Most important parameter: BLtop OR Hcrit OR W*

Some variables only needed occasionally

(but can get bit if don't use when it *is* important)

B/S CAPE

EXAMPLE OF A BLIPMAP - BLtop



What is Predicted ?

How high will I climb ? (cloud-free)

Hcrit (flat terrain) OR BLtop (complex terrain)

How strong will the thermals be ?

W* (must subtract sink rate - best as relative measure)

Will thermals be broken by wind shear ?

B/S

How uncertain is the max. soaring height prediction ?

BLtop variability

What will the average wind be at altitude ?

Wind Speed & Direction (BL averaged)

Will there be a convergence line ?

Convergence Max. (independent of BLtop/Hcrit)

What is Predicted ?

Cloud predictions have more uncertainty

Will there be overdevelopment ?
OD potential, OD cloudbase

What are the chances of a thunderstorm ?
CAPE

Will there be puffy clouds in the BL ?
Relative Humidity Max. (empirically, yes if > 40-50%)

What will be the puffy cloud cloudbase ?
Not yet predicted

BLIPMAPS NOT FOR DUMMIES

IT'S A MODEL NOT A CRYSTAL BALL !

Prediction based upon many model assumptions,
some better than others
Intent is to provide forecast that is readily accessible,
nonetheless some knowledge/sophistication often required
to obtain best forecast

Analogy: use of a variometer to center a thermal best when
one knows about and applies its time delay
instead of simply using instanteous reading
(but weather model more complex than a vario)

Better results obtained when add knowledge of
how model works and its weaknesses

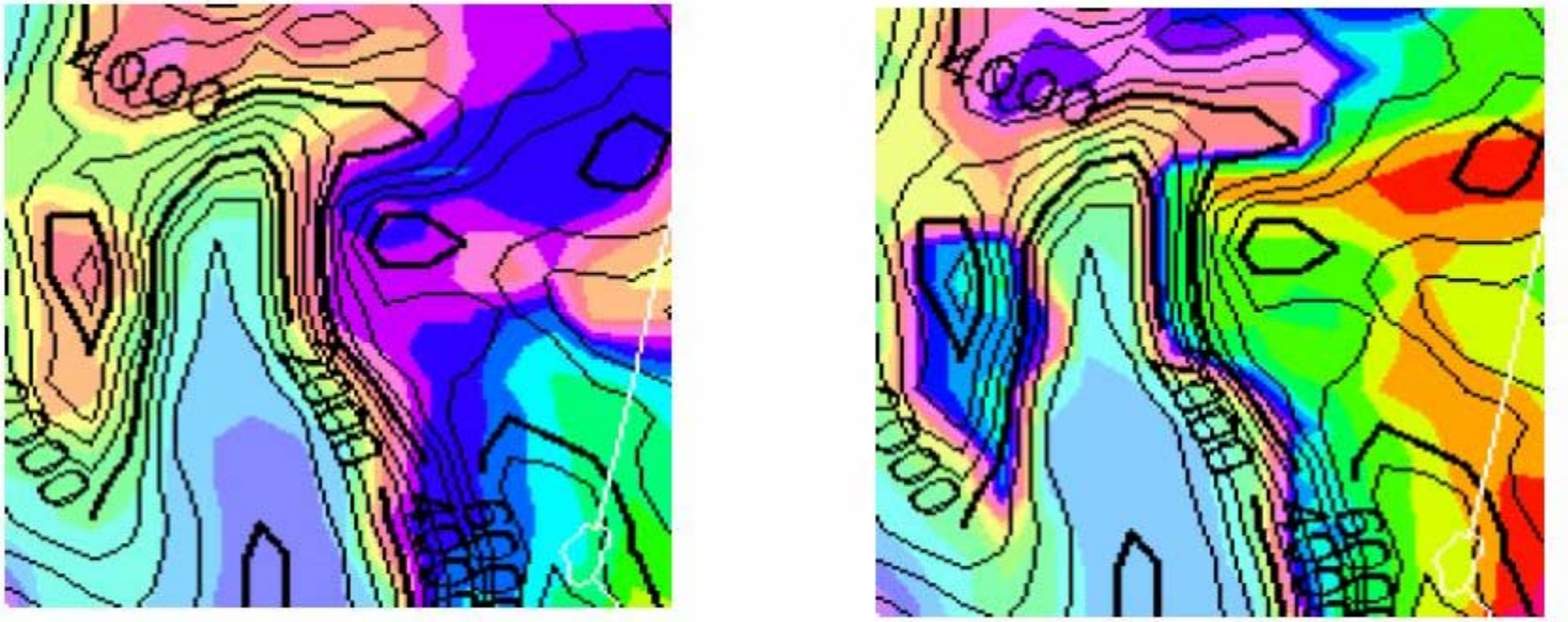
Relative predictions better than absolute predictions

BLTOP COMPARISON EXAMPLE

Relative predictions better than absolute predictions

Sep. 30

Record-flight Day
Oct. 1



Height of Boundary Layer Top (x1000 ft MSL)

Subtletys and Common Sense

Relative forecasts more accurate than absolute ones

Relative in **time**

Relative in **space**

Relative to **model topography**

Predicted timing may differ

Enroute, evaluate actual day vs. predicted day
(don't depend too much on a forecast!)

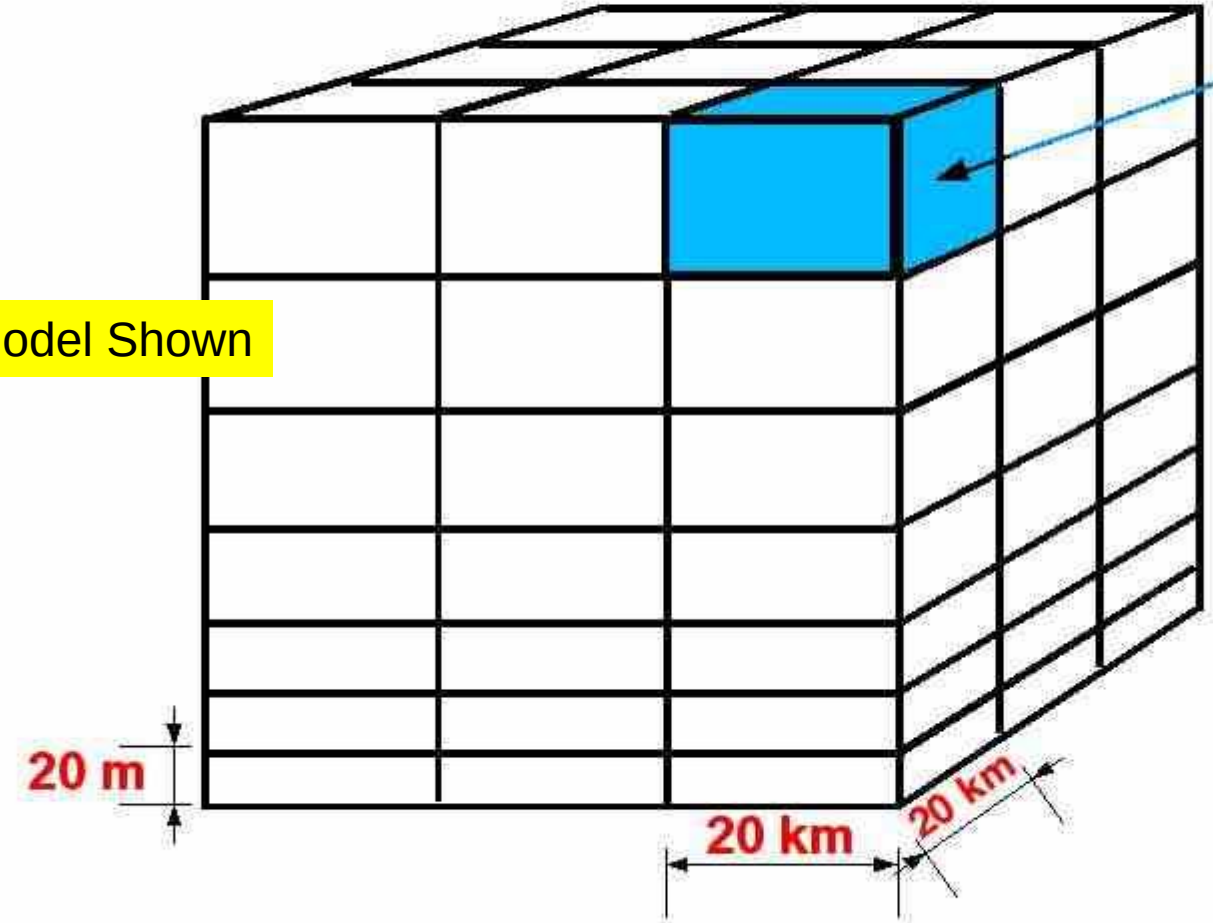
BLIPMAP predicts averages but pilots try to fly maxs.

Forecasts use smoothed terrain

For best results add experience and empiricism

Model Grid Resolution

Limits prediction precision – grid cell *average* predicted



Topography resolution effectively twice as coarse as grid resolutio

MODEL KNOWS ABOUT:

(though imperfectly)

- Existing global weather conditions
- Predicted global weather conditions
- **Differential equations of motion and thermodynamics**
- Sun
- Cloud effects on sunshine
- Surface/soil type (crude)
- Vegetation (crude)
- Soil moisture (predicted)
- Radiosonde obs (twice-daily)
- Satellite-observed clouds
- Observed surface temperatures

Specific Model Difficulties

Model can only predict what it knows about

- Thin clouds (when less than grid cell height)
- Surface type (when very variable over grid cell)
- Seasonal surface changes
- Smoke not forecast so effects ignored
- When topography not well resolved

YOU CAN AUGMENT BLIPMAPS WITH:

Local NWS Forecast Discussion
(provides overview of general conditions)

FSL Interactive Sounding
(provides details to those able to read sounding profiles)

Satellite Photos
(provides observed clouds)

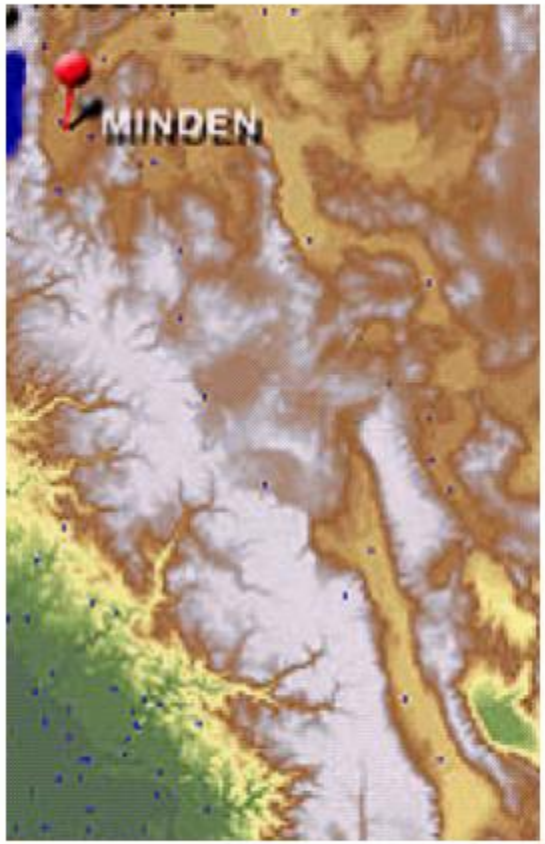
Updated BLIPMAPS
(since previous evening ones may have changed)

Eyeball
(ultimate source for local weather)

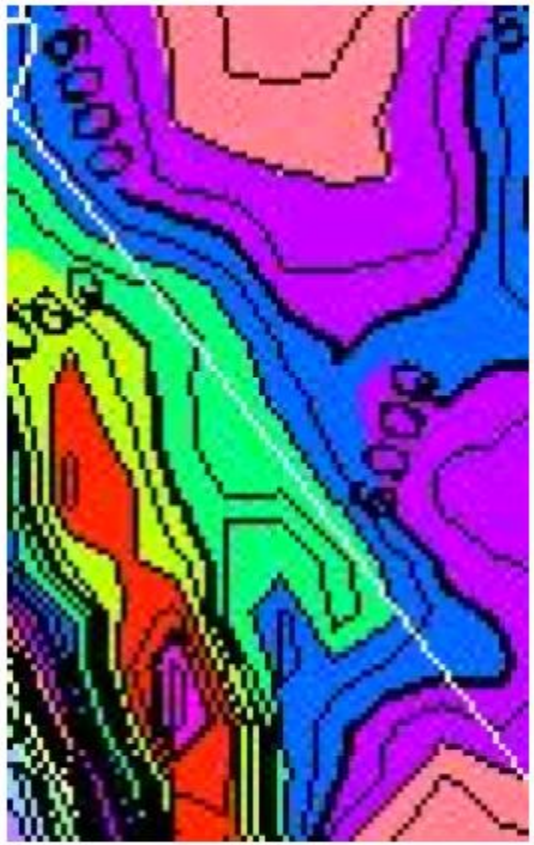
Model uses smoothed topo

Produces several "gotcha"s when terrain is significant

Actual



Model

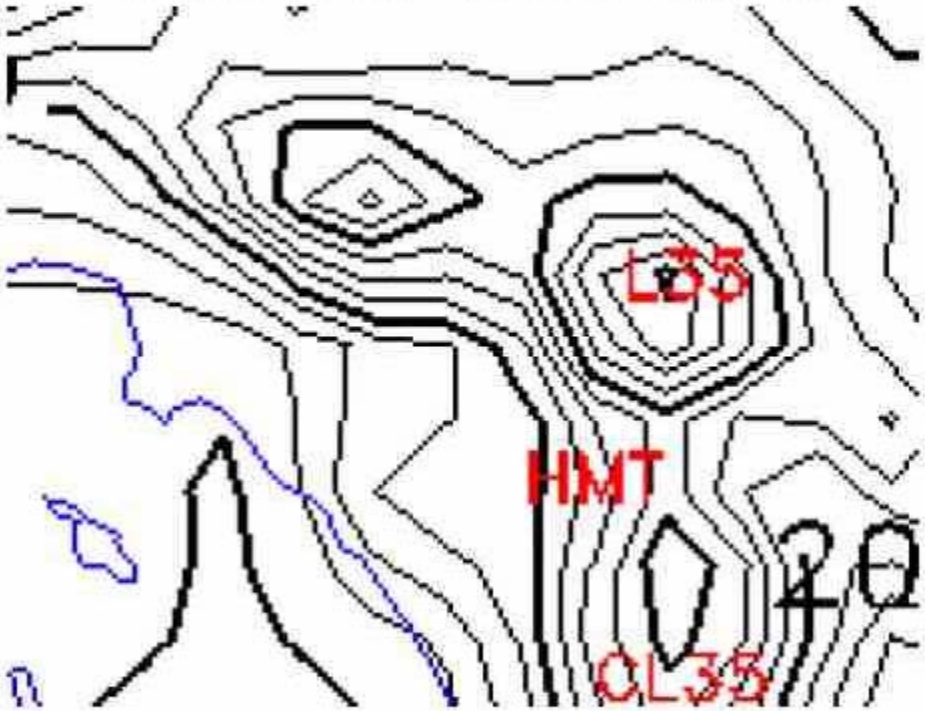


(1) Small-scale terrain ("sub-grid scale") not known to model

SMOOTHED TOPO (CONT'D)

(2) Prediction "fuzziness": best prediction made relative to smoothed terrain not at exact lat/long

Example: smoothing spreads mountain width



Another example: for asymmetrical mountain ridge, smoothing shifts ridgeline location from actual lat/long

SMOOTHED TOPO CONSEQUENCES

User must be sophisticated/knowledgeable enough to realize that model predictions are based solely on the terrain that it knows about, a smoothed terrain *(especially out west)*

TWO CONSEQUENCES:

- **Small-scale terrain simply not there**
  In regions with topography not known to model need to make, based upon previous experience, empirical adjustment to prediction to get better forecast
- **Prediction "fuzziness" near abrupt terrain changes**
  i.e. "best" prediction at slightly different lat/long where model elevation closer to actual elevation (shift of 11nm = 1 grid cell not unusual)

BLIPMAPs display the *smoothed* model terrain - this is a *feature* allowing realistic evaluation of model predictions relative to that smoothed terrain

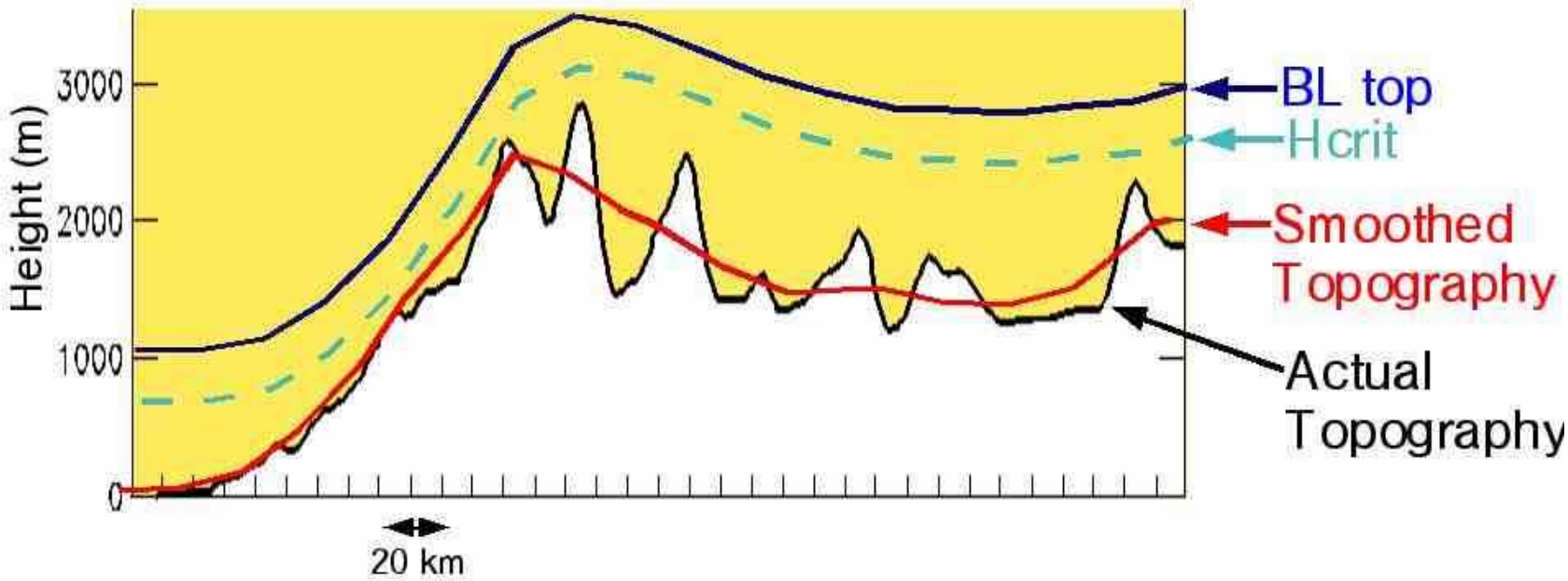
Using exact lat/long can give poor results in complex terrain

Use of Experience & Empiricism: prediction in complex terrain

Model predicts grid average but pilots fly peaks not resolved by model.
And at small-scale ridge get convergence not predicted by model.

SO

must make empirical adjustment to predictions
adding pilot knowledge/experience to offset model ignorance
e.g. use of Bltop better than Hcrit in complex terrain



Relative predictions better than absolute ones

ADVANCED BLIPMAPS

Advanced Parameters:

Cloud predictions: not-straightforward

Thermal Height Variability: indicates uncertainty

Convergence: only important for some locations

Consider Multiple Times:

(use javascript viewer)

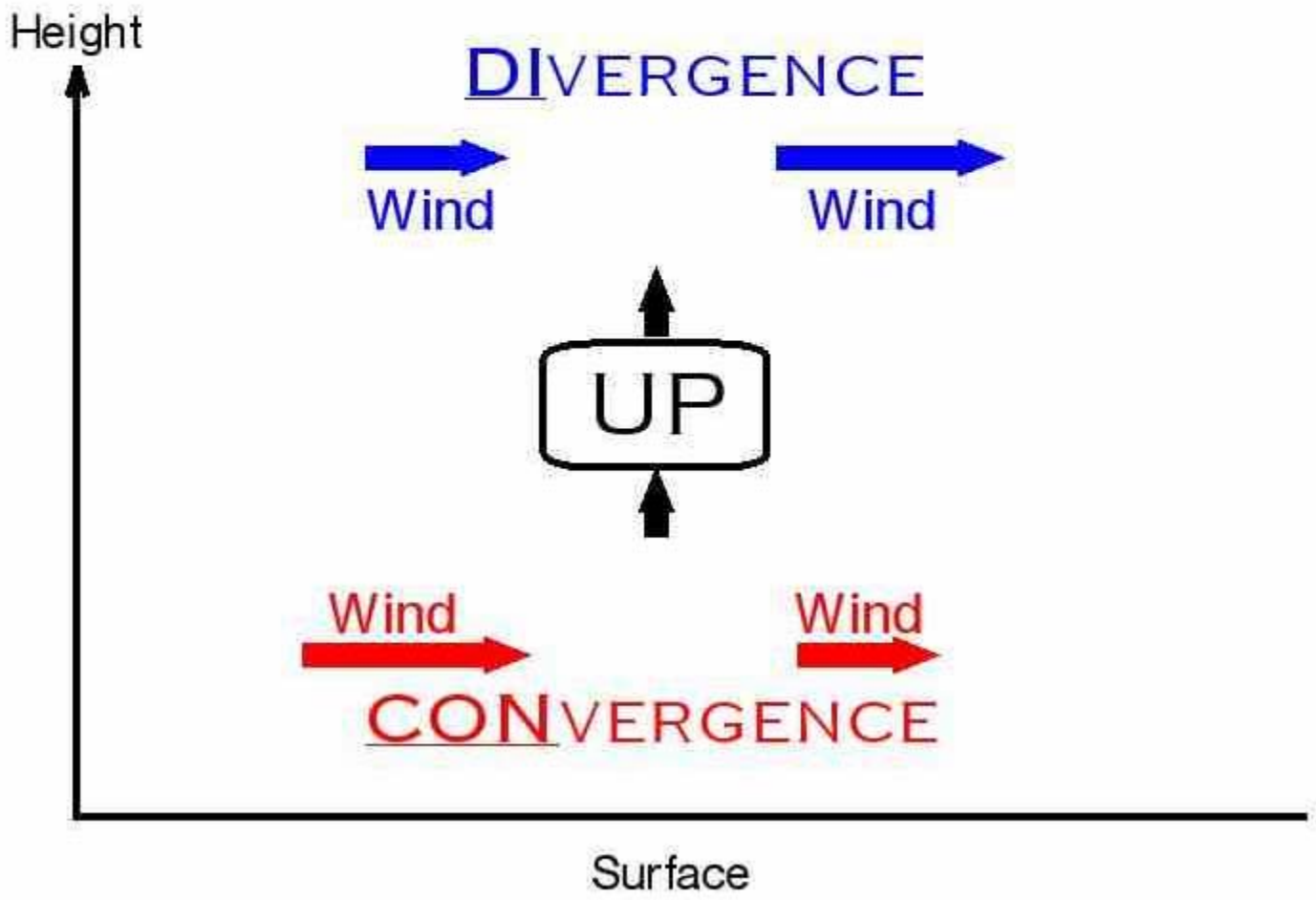
Can indicate start or end of day

Some parameters more important at end of day (OD, CAPE)

CONVERGENCE

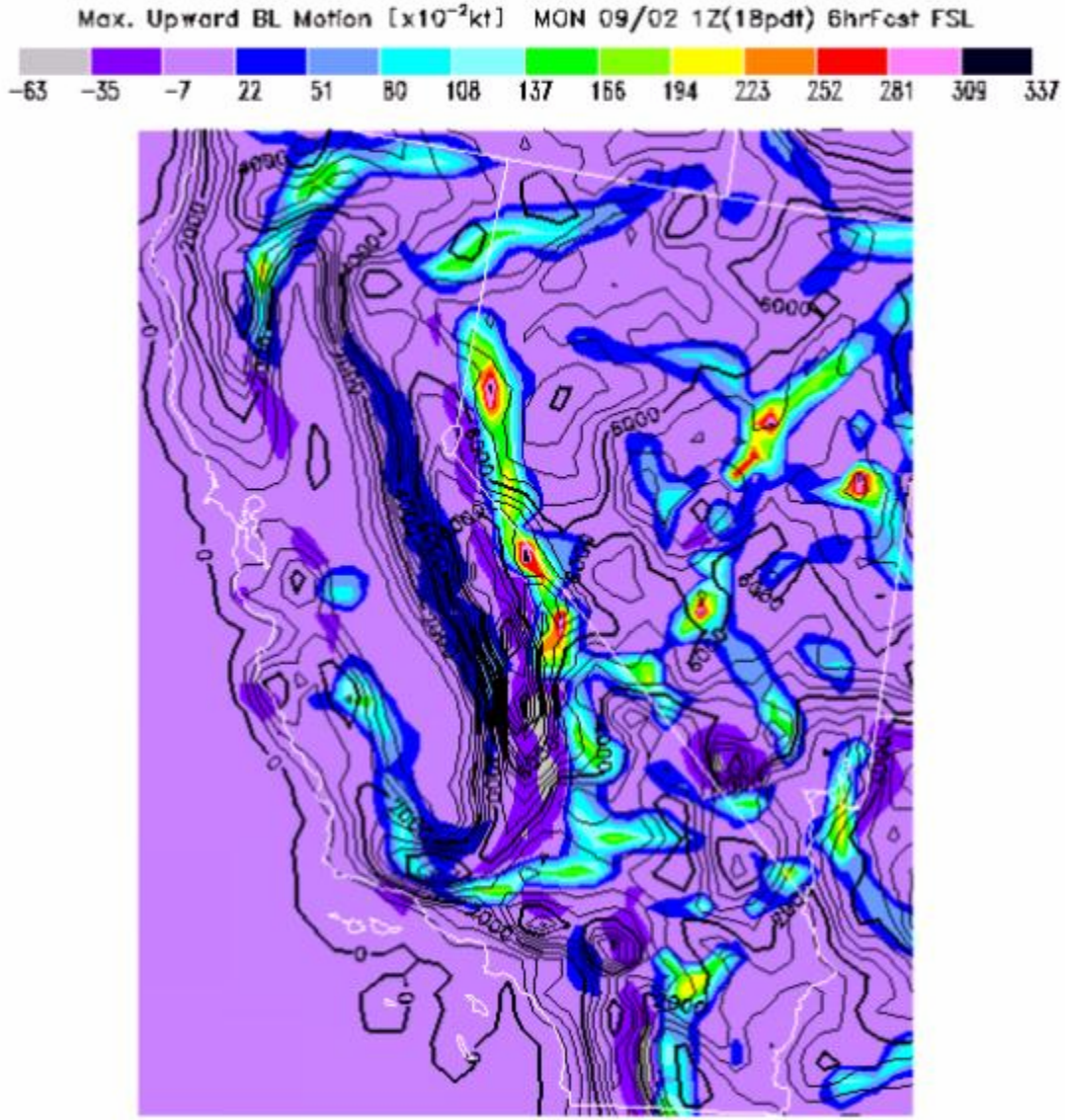
aka "*horizontal* wind shear" ("shear line")

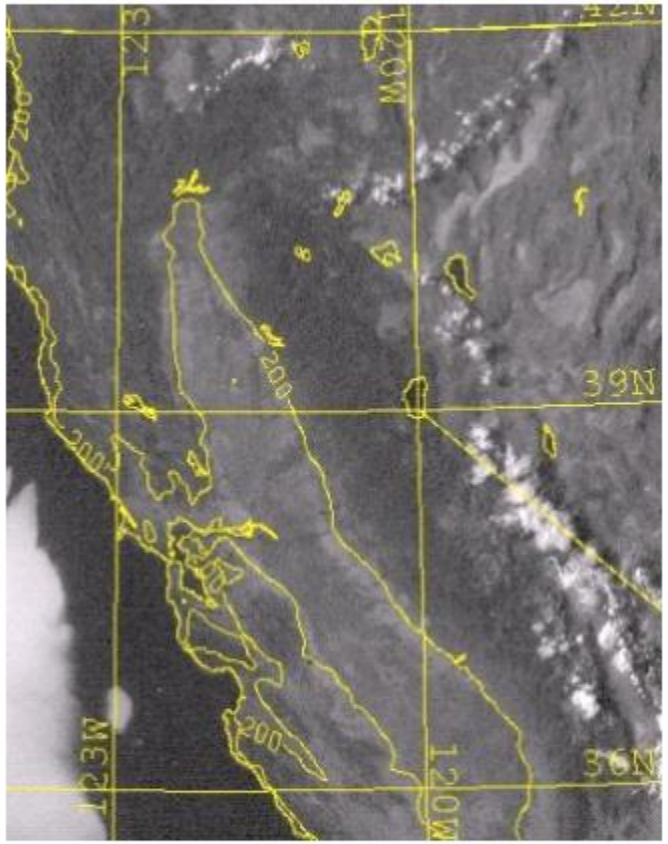
BLIPMAP predicts max. large-scale vertical velocity in BL



Convergence Example

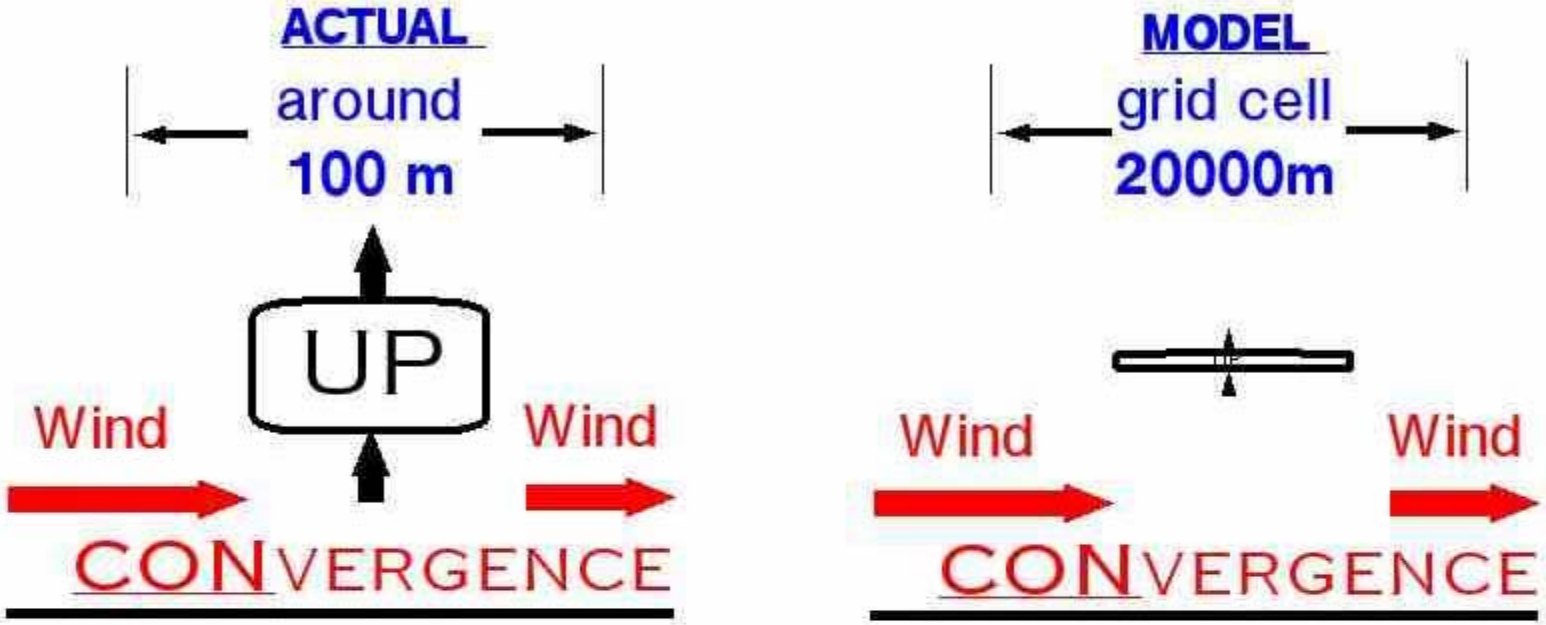
(Described in detail on the website, including time loops)





Two convergence lines: (1) NW-SE line which has moved east of its original Tahoe_Sierra location (2) NW-SW line cutting across NW corner of Nevada

CONVERGENCE NOT WELL RESOLVED

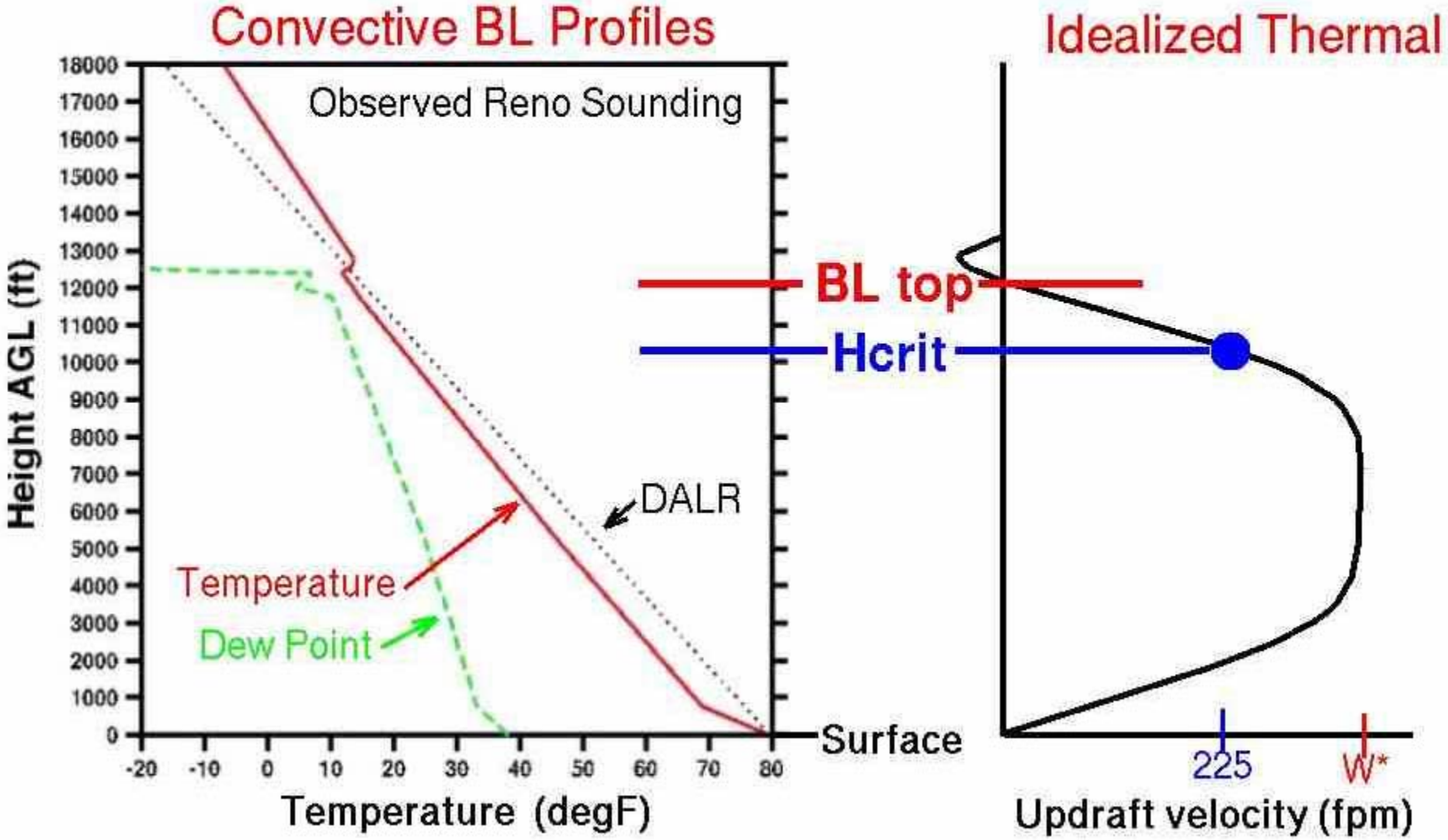


SO

- only strong larger-scale cases will be predicted
  (large-scale topo forced cases better than sea-breeze)
- predicted effect on BL top insignificant
  so must consider convergence and BLtop independently
- many differences between actual and model results
  relative values useful, but not absolute ones (predicted convergence changes if resolution changes)

CONDITIONS IN
A STRONGLY CONVECTIVE BOUNDARY LAYER

(more info at "Sounding Analysis webpage" link)



PARAMETER SPECIFICS

Some specifics of the height variability, B/S ratio, and OD prediction parameters were discussed during convention talk. These will be later be assimilated into the "Parameter Description" on the BLIPMAP pages.

FUTURE

ADDITIONAL "BLIP"s FOR OTHER REGIONS

- How to choose is a problem

ADDITONAL "HOW-TO-USE" INFO

- Based on survey results

DATA AVAILABLE FOR OTHER USES

- For flight display software such as SeeYou
- Not yet in cockpit !

ADDITIONAL PARAMETERS

- Cloud Base for "puffy" (non-OD) clouds

ADD ETA MODEL PREDICTIONS ??

- Higher resolution (12km vs 20km)
- Forecasts out to 84 hours
- Comparison of 2 models with differing strengths/weaknesses
- $$