Center for Western Weather and Water Extremes

SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

Quantification of Atmospheric River Landfall Errors at Bodega Bay, California in the Global Forecast System and West-WRF

Brian Kawzenuk, Andrew Martin, F. Martin Ralph

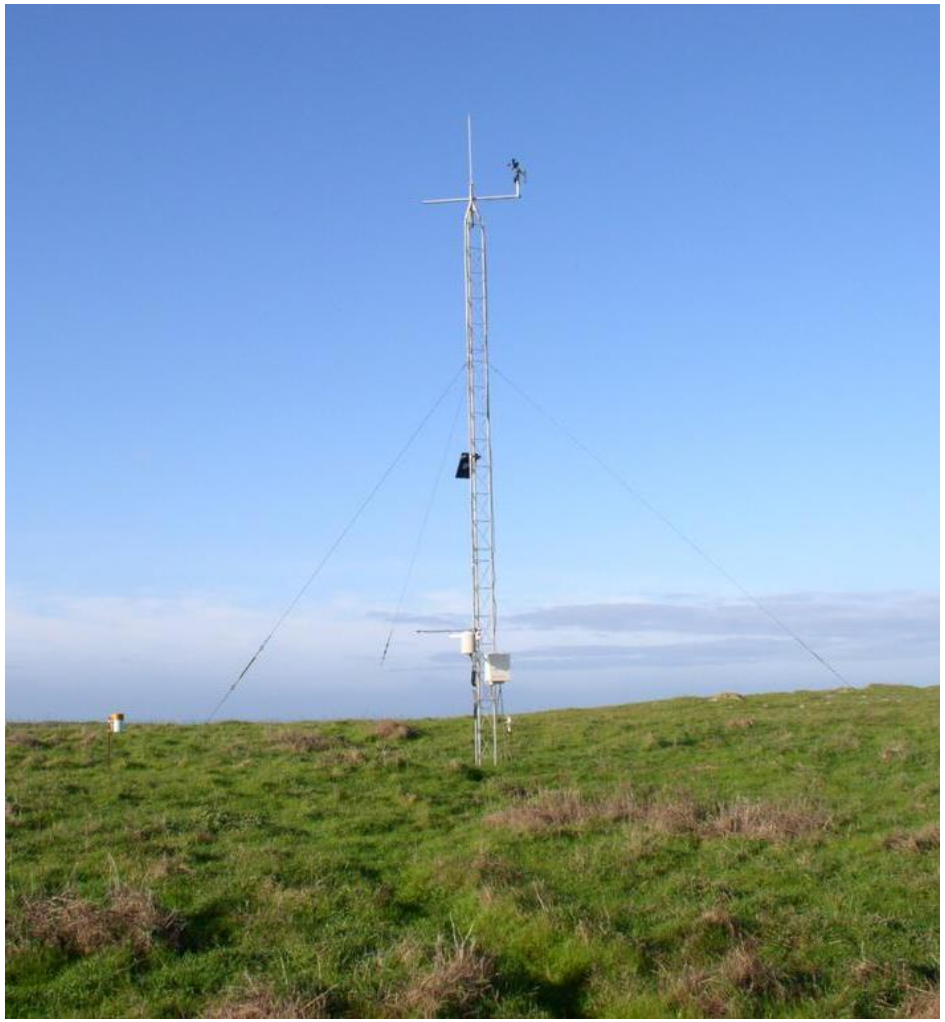
Center for Western Weather and Water Extremes (CW3E)

2016 International Atmospheric Rivers Conference

9 August 2016

Methodology

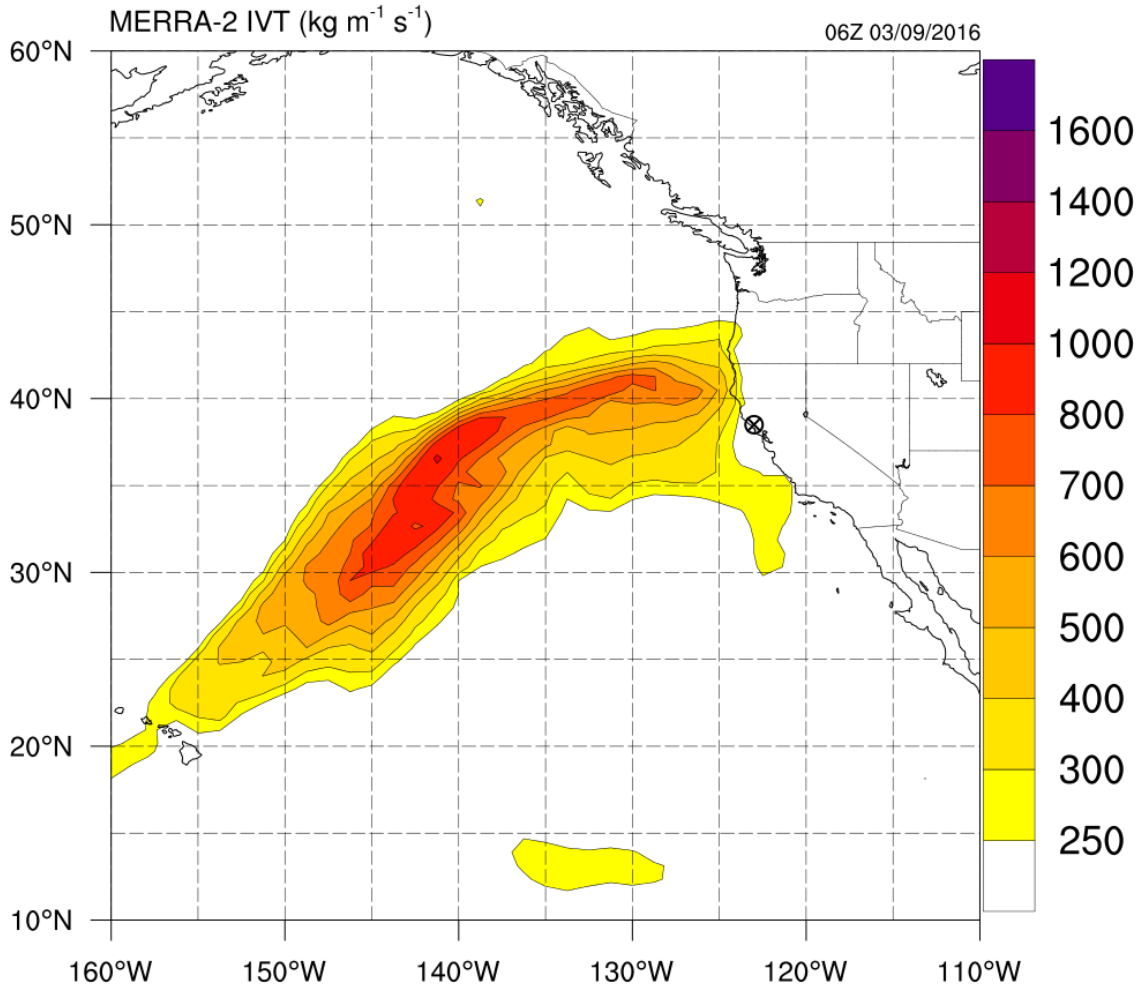
- Bodega Bay, CA Atmospheric River Observatory (ARO)
  - CA DWR-sponsored state-wide Enhanced Flood Response and Emergency Preparedness (EFREP) observing network
- GPS Trimble Water Vapor
- 449 MHz Wind Profiler



CW3E

Methodology

- 11 moderate strength ARs that made landfall over BBY
- ARs defined by methodology in Ralph et al. 2013
  - IWV >2 cm
  - Upslope water vapor flux >15 cm (m s^{-1})
- Modern-Era Retrospective Analysis for Research and Applications (MERRA) reanalysis data at the time closest to landfall used to determine AR location
  - IWV >2 cm
  - IVT >250 kg m^{-1} s^{-1}



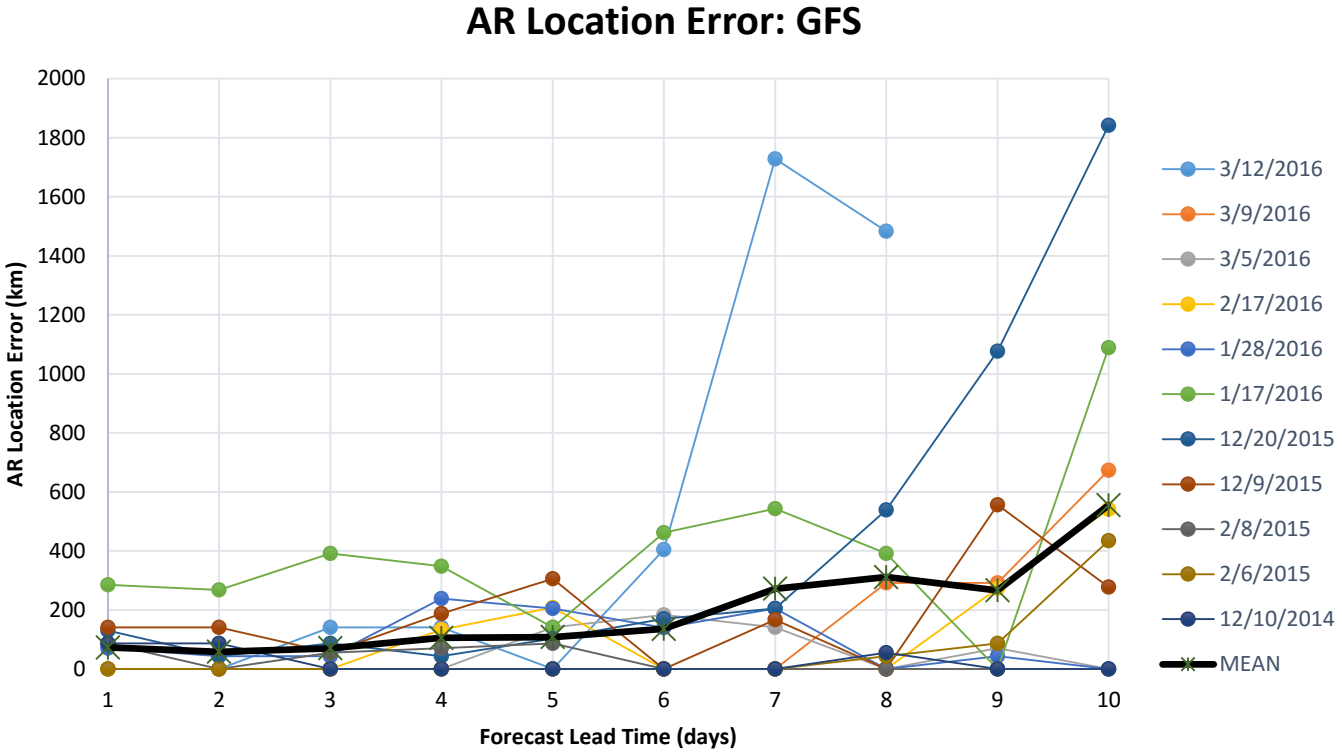
CW3E

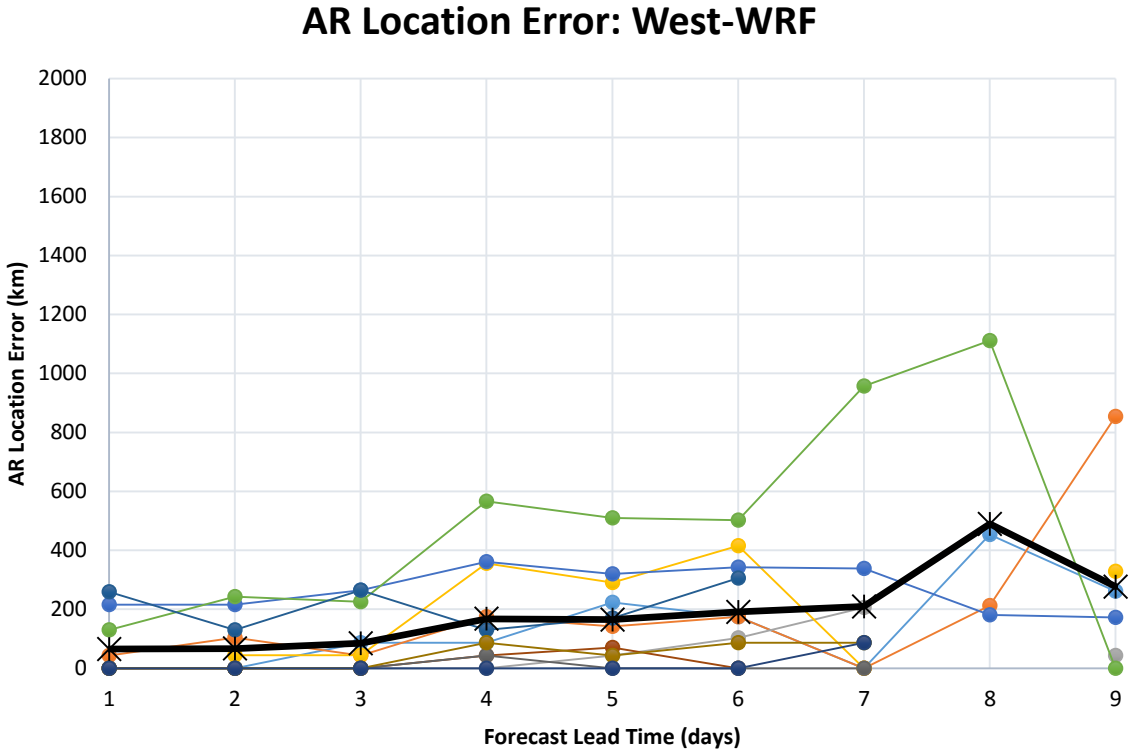
Methodology

- Global Forecast System and West-WRF
  - 1–10 day lead times

- AR location at BBY observed landfall time and time of modeled initial landfall at BBY were noted and compared to reanalysis and observations
  - 1500 UTC 3/12/2016
  - 0800 UTC 3/9/2016
  - 1700 UTC 3/5/2016
  - 2100 UTC 2/17/2016
  - 1700 UTC 1/28/2016
  - 0400 UTC 1/17/2016
  - 1400 UTC 12/20/2015
  - 1300 UTC 12/9/2015
  - 0900 UTC 2/8/2015
  - 0400 UTC 2/6/2015
  - 1500 UTC 12/10/2014

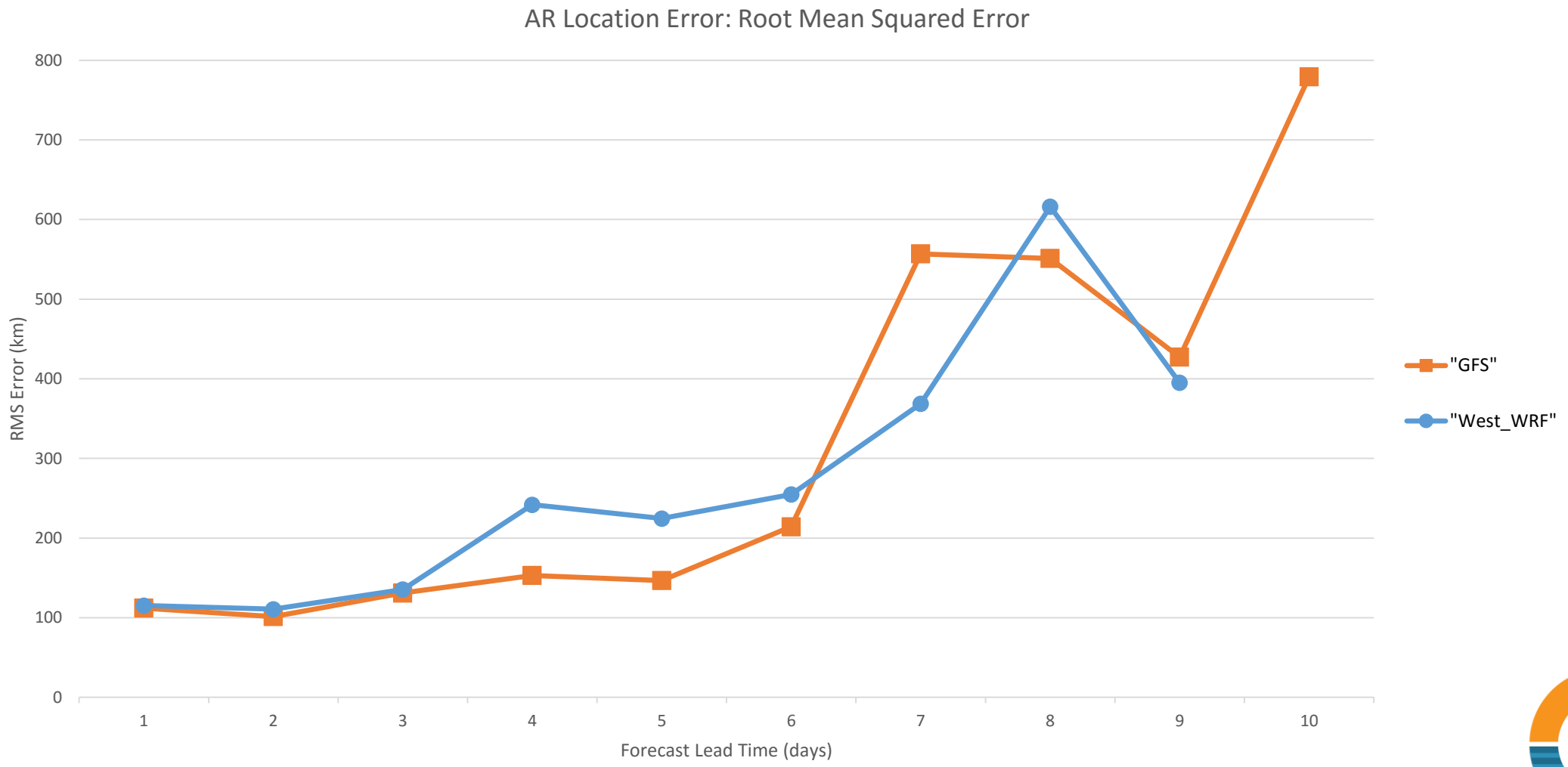
AR Location Errors





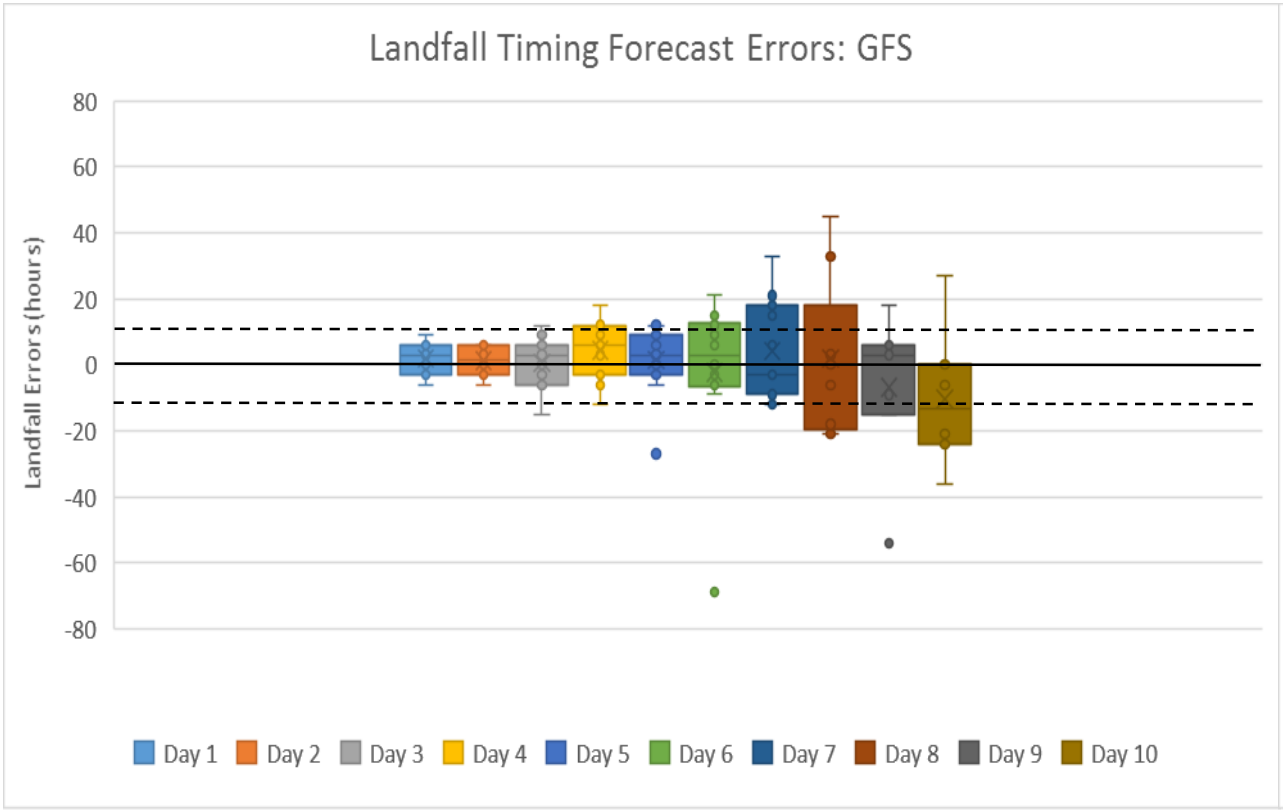
CW3E

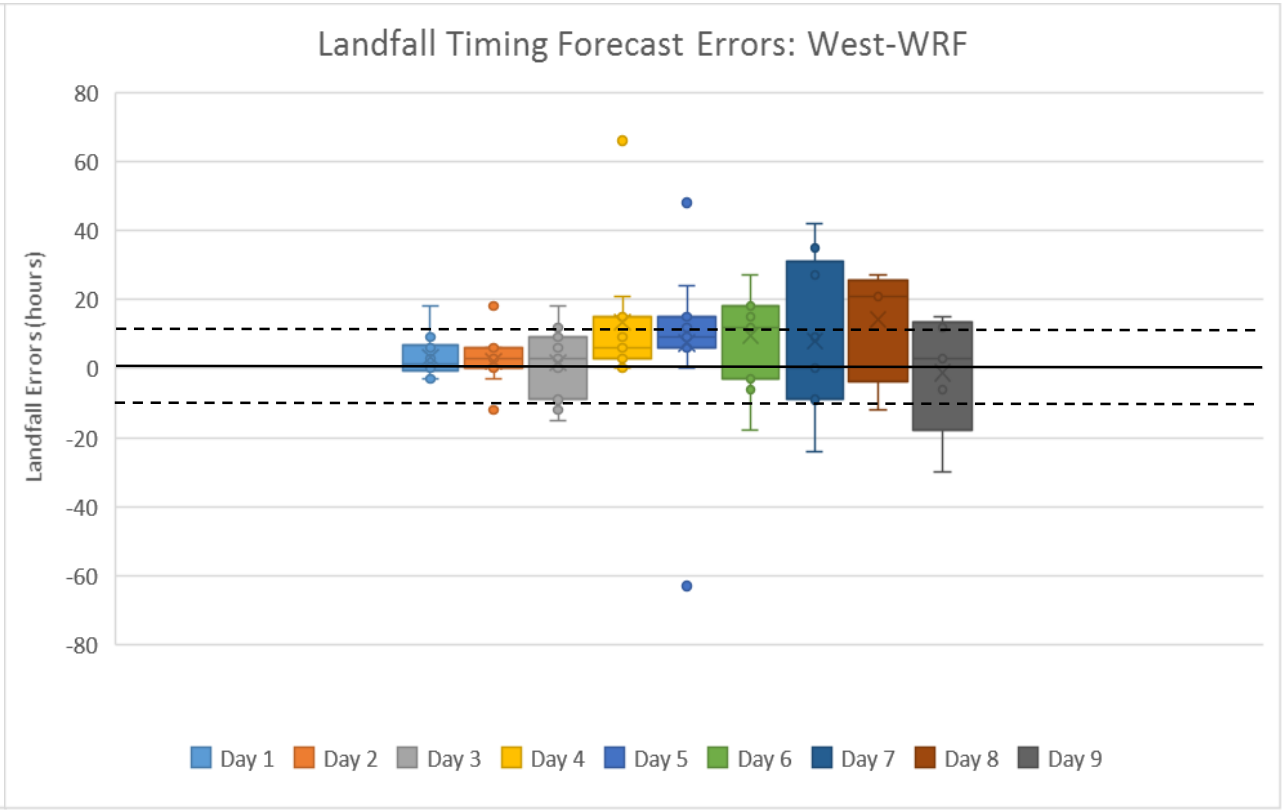
AR Location Errors



CW3E

AR Landfall Timing Errors

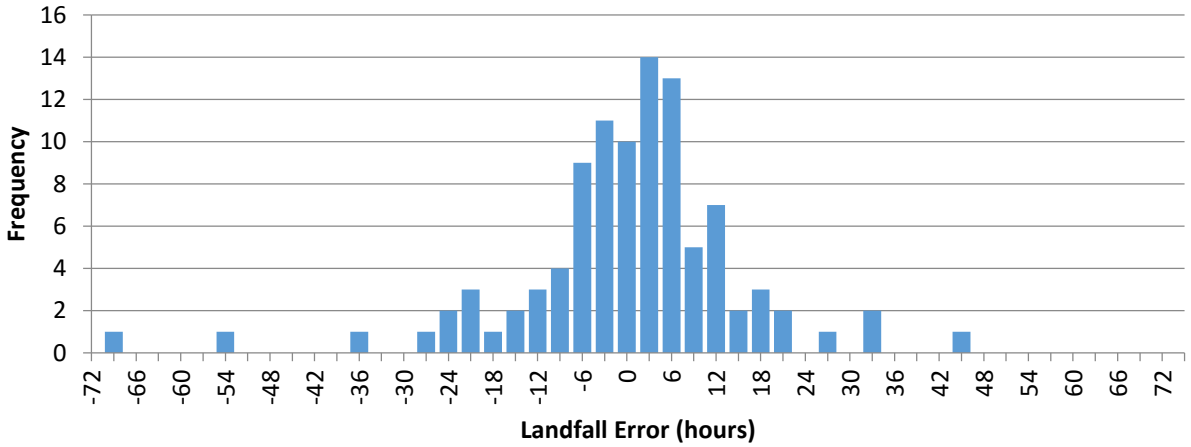




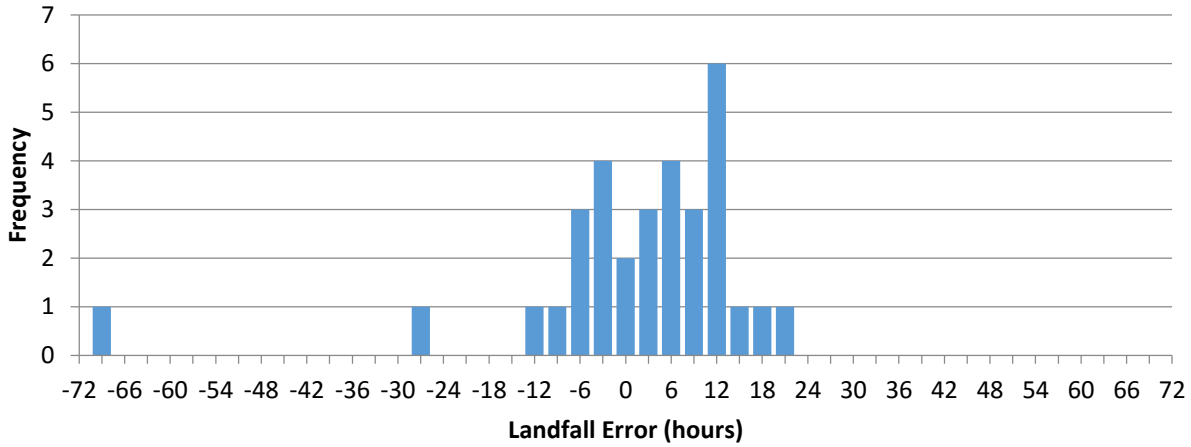
CW3E

AR Landfall Timing Errors: GFS

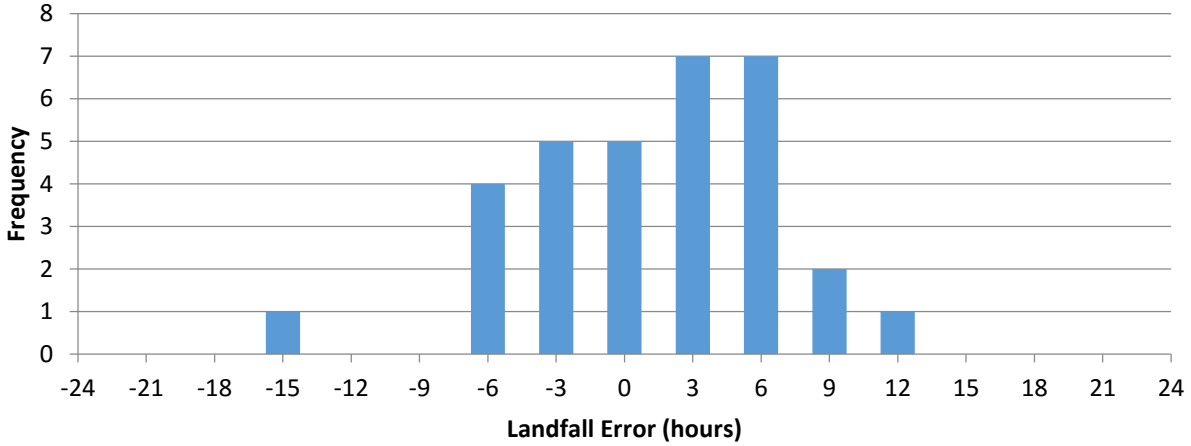
All Days



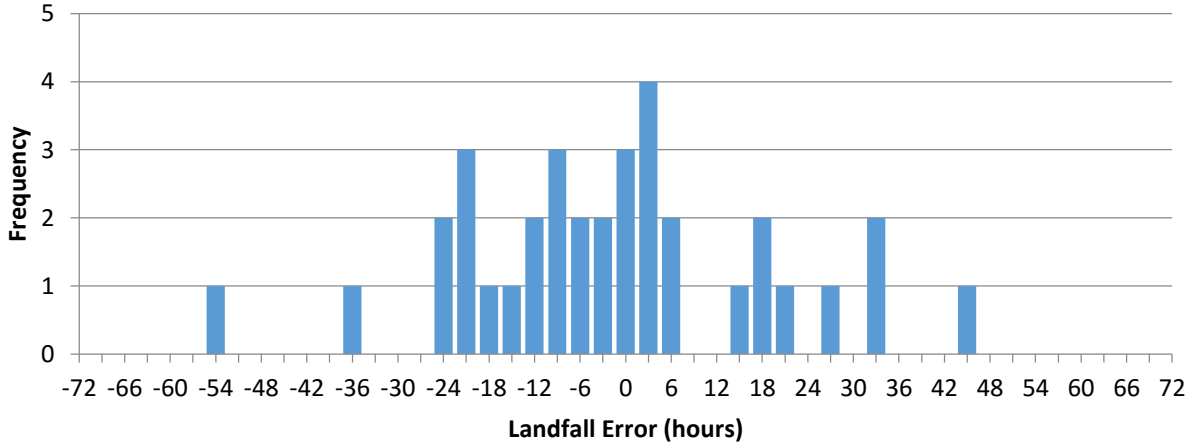
Days 4-6



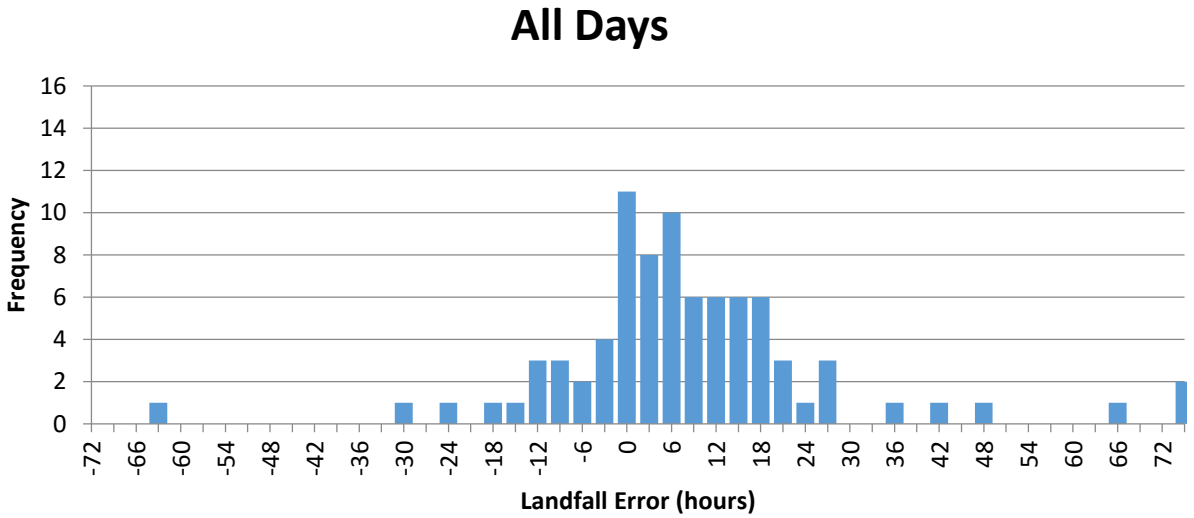
Days 1-3

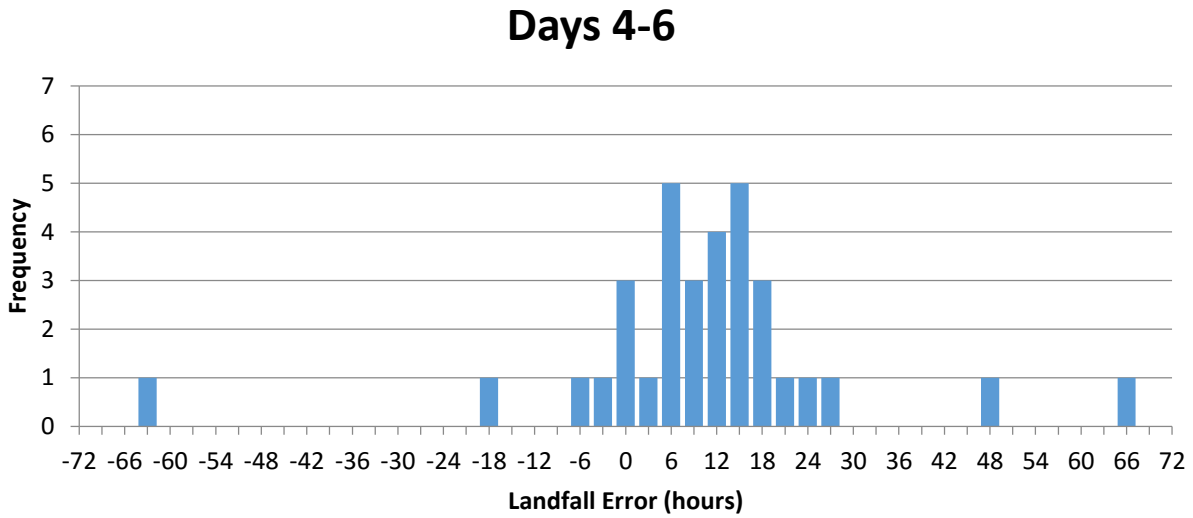


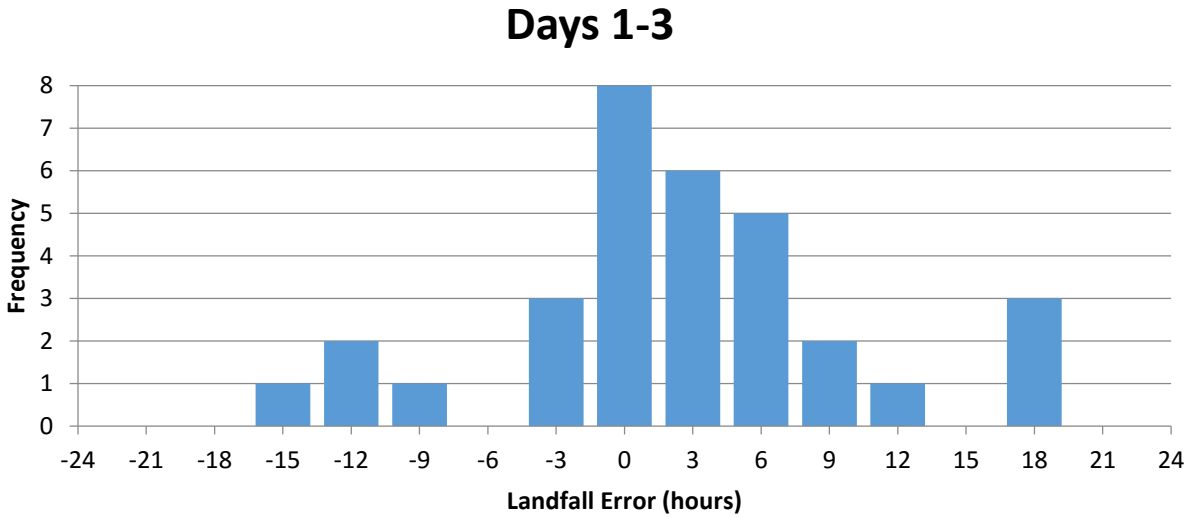
Days 7-10

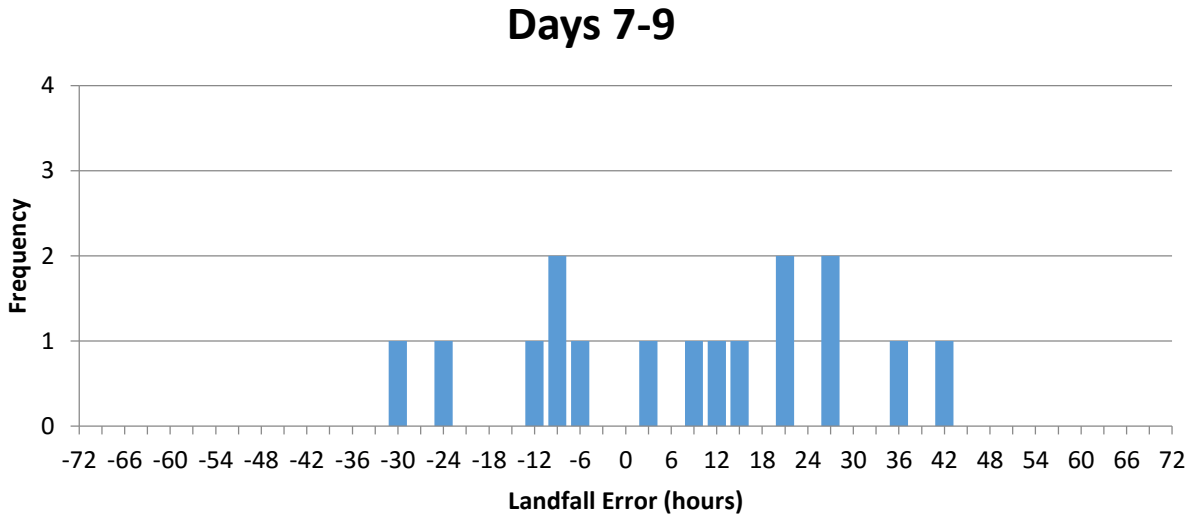


AR Landfall Timing Errors: West-WRF

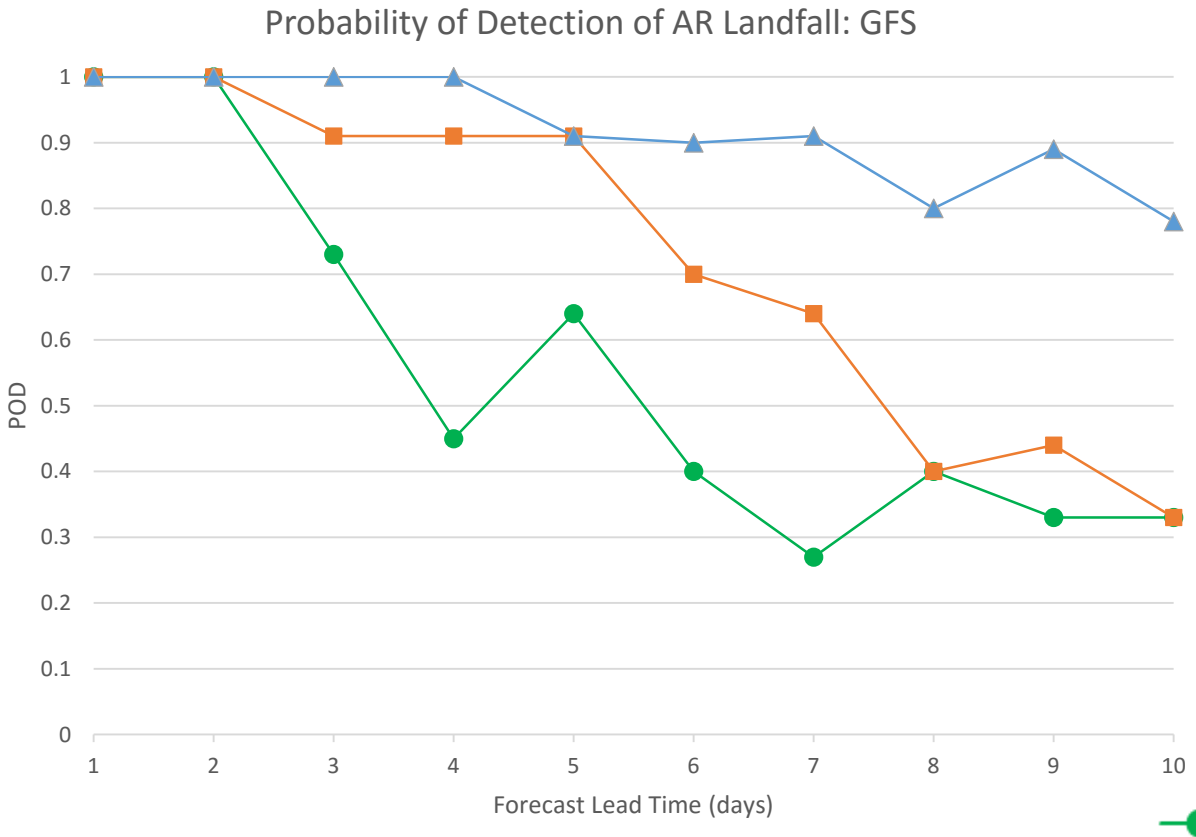


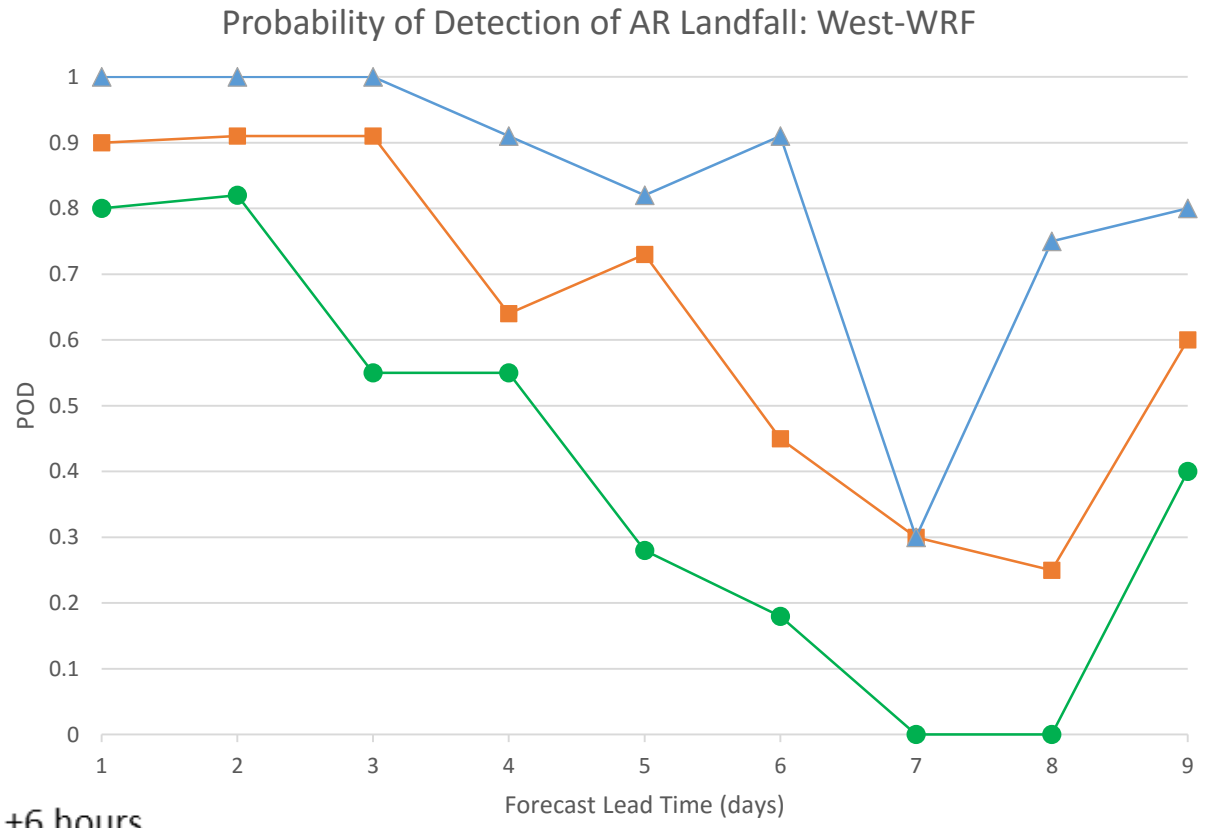






POD of AR Landfall





CW3E

Future Work

- Duration of AR conditions
- AR strength
  - IWV
  - WV Flux
- Additional cases
  - Use of an AR detection method
- Additional locations
- Additional models

Summary

- Evaluation of GFS and West-WRF during 11 AR events
- Both models show a slight late bias for landfall timing
- Both models show high skill in forecasting the landfall of an AR within 24 hours of observed landfall
- Location and timing errors increase significantly beyond ~5 day lead time