Bringing Winds Closer to the Coast with QuikSCAT and RapidScat

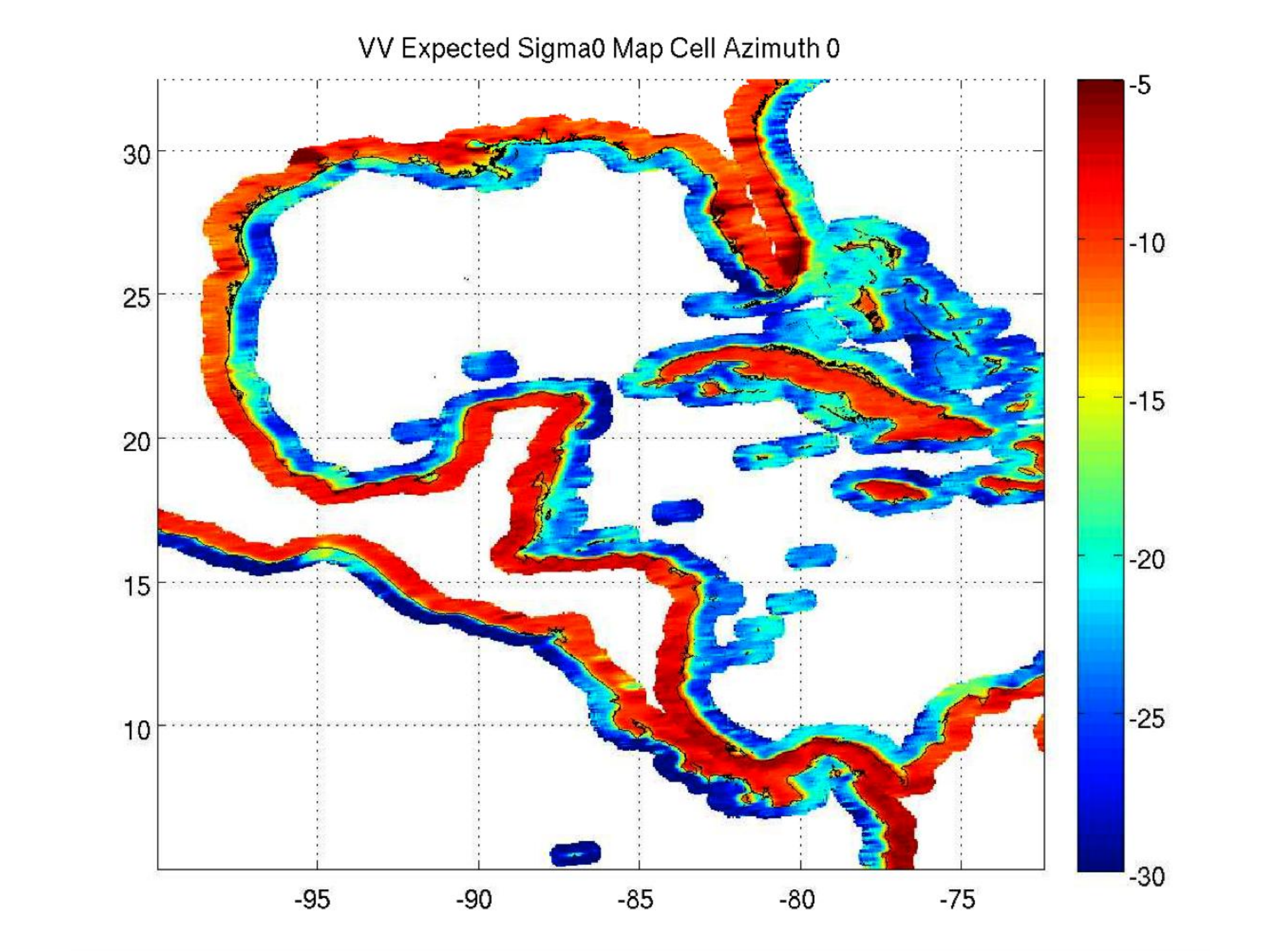
Alexander Fore, Bryan Stiles, Ted Strub and Ernesto Rodriguez

Coastal Processing Methods

- Land Contamination Ratio (LCR):
  - Owen and Long TGARS 2009
  - Compute X-factor weighted portion of slice over land, call this the land contamination ratio.
- In processing apply a threshold on this value for inclusion in wind retrieval
  - We have implemented this for QuikSCAT and RapidScat.
  - The LCR method is a stepping stone on the way to the next method…

Land Contamination Ratio Expected Sigma0 (LCRES)

- LCRES = LCR * ES (Expected Sigma0)
- Two step process:
  - 1: Preprocessing: Pre Compute Maps of Expected Sigma0 (ES = ES(lon, lat, cell azi))
    - Seasonal time scale averaging.
    - Expected Sigma0: For all slices in that intersect a given map pixel:
      - Compute portion of slice X factor that lies within pixel
      - Accumulate sums of X factors in map pixel and portion of signal energy in pixel
  - 2: During wind processing
    - Compute LCR value for every slice
    - LCRES = LCR * ES
- Conservative method: threshold on LCRES value for inclusion in wind retrieval
- Aggressive method: Subtract LCRES from observed sigma0 and rescale by 1 – LCR:
  - Sigma0_corrected = (sigma0_obs – LCR * ES) / (1-LCR)
- We have computed the expected sigma0 for QuikSCAT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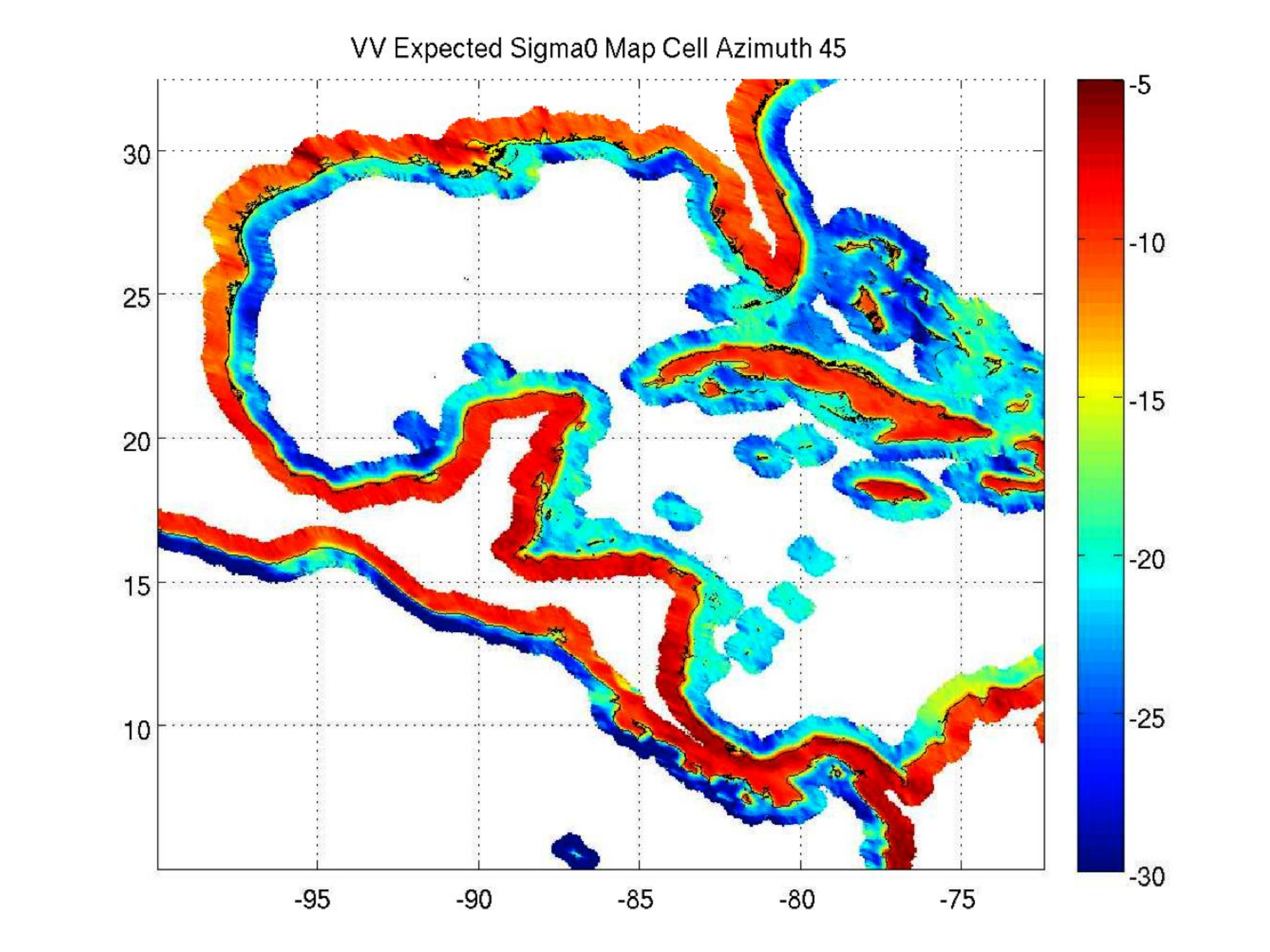
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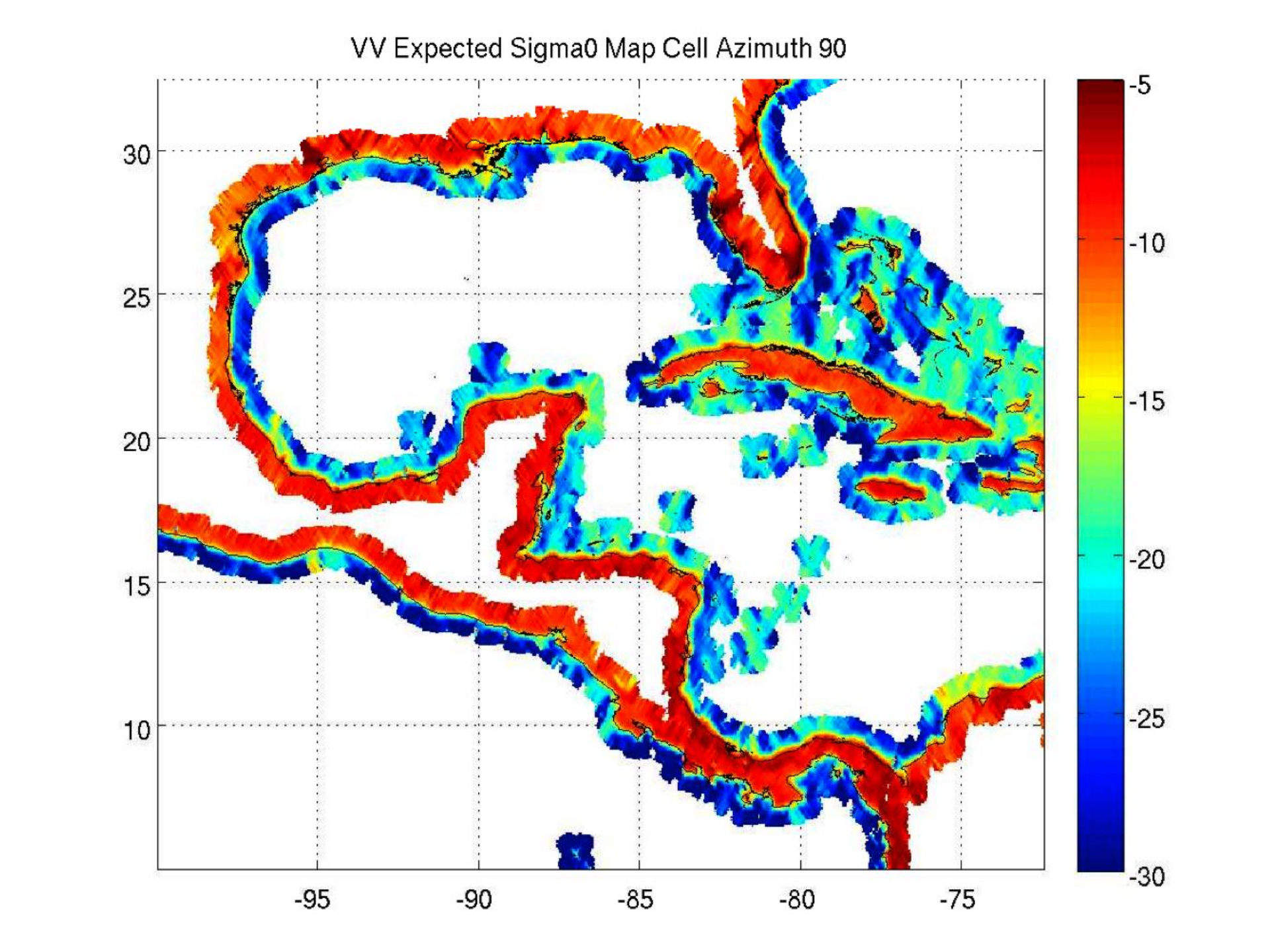
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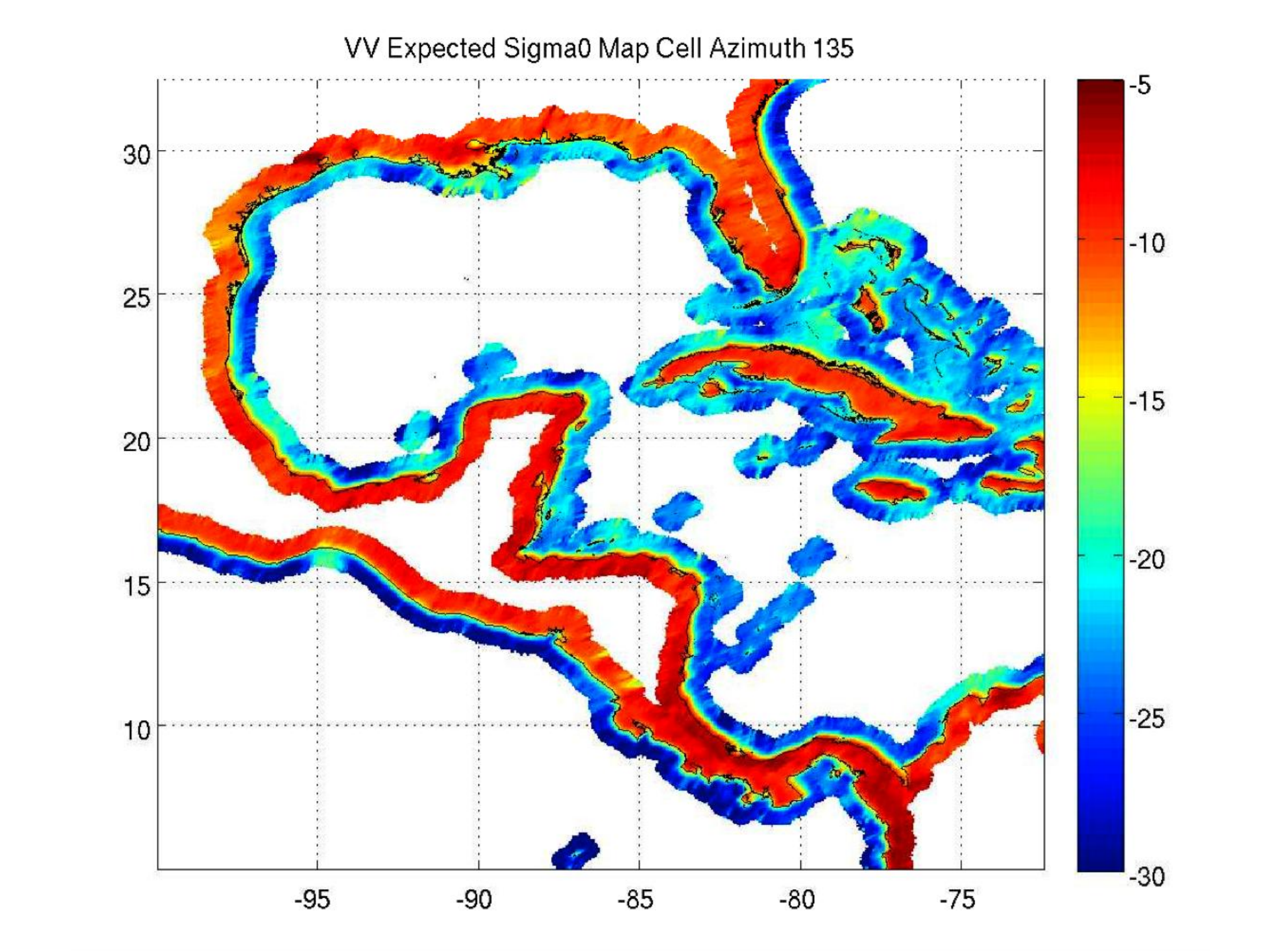
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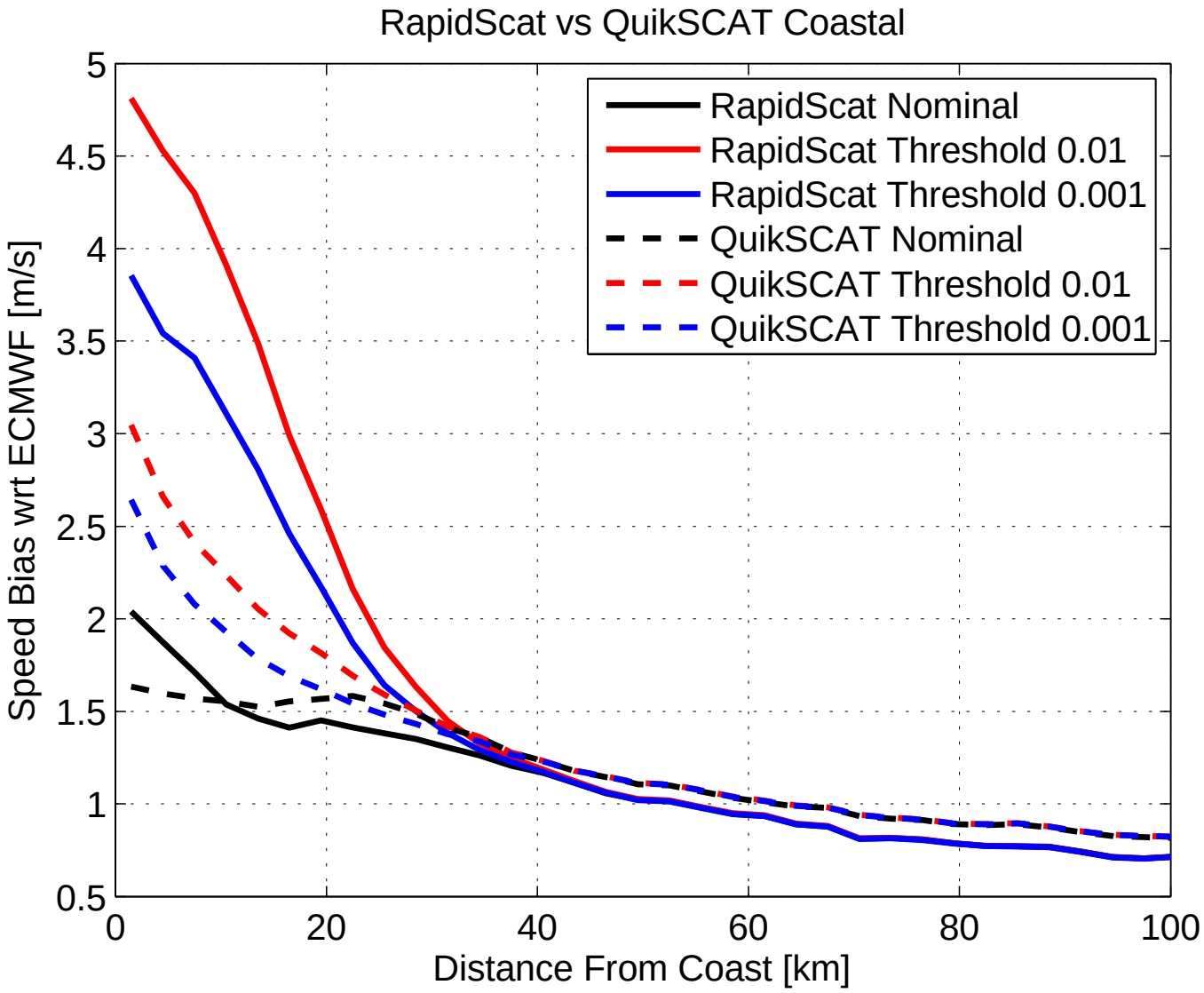
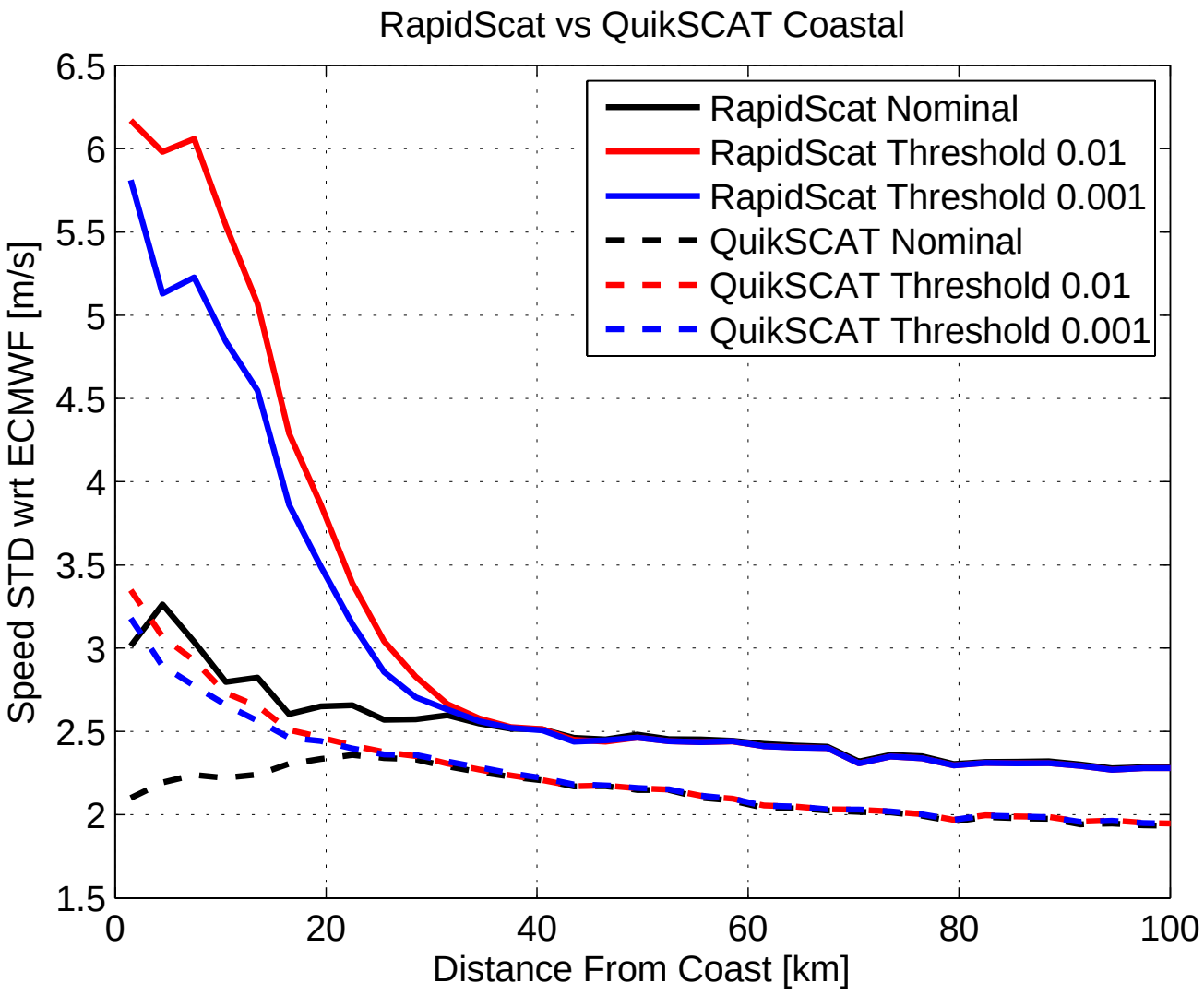
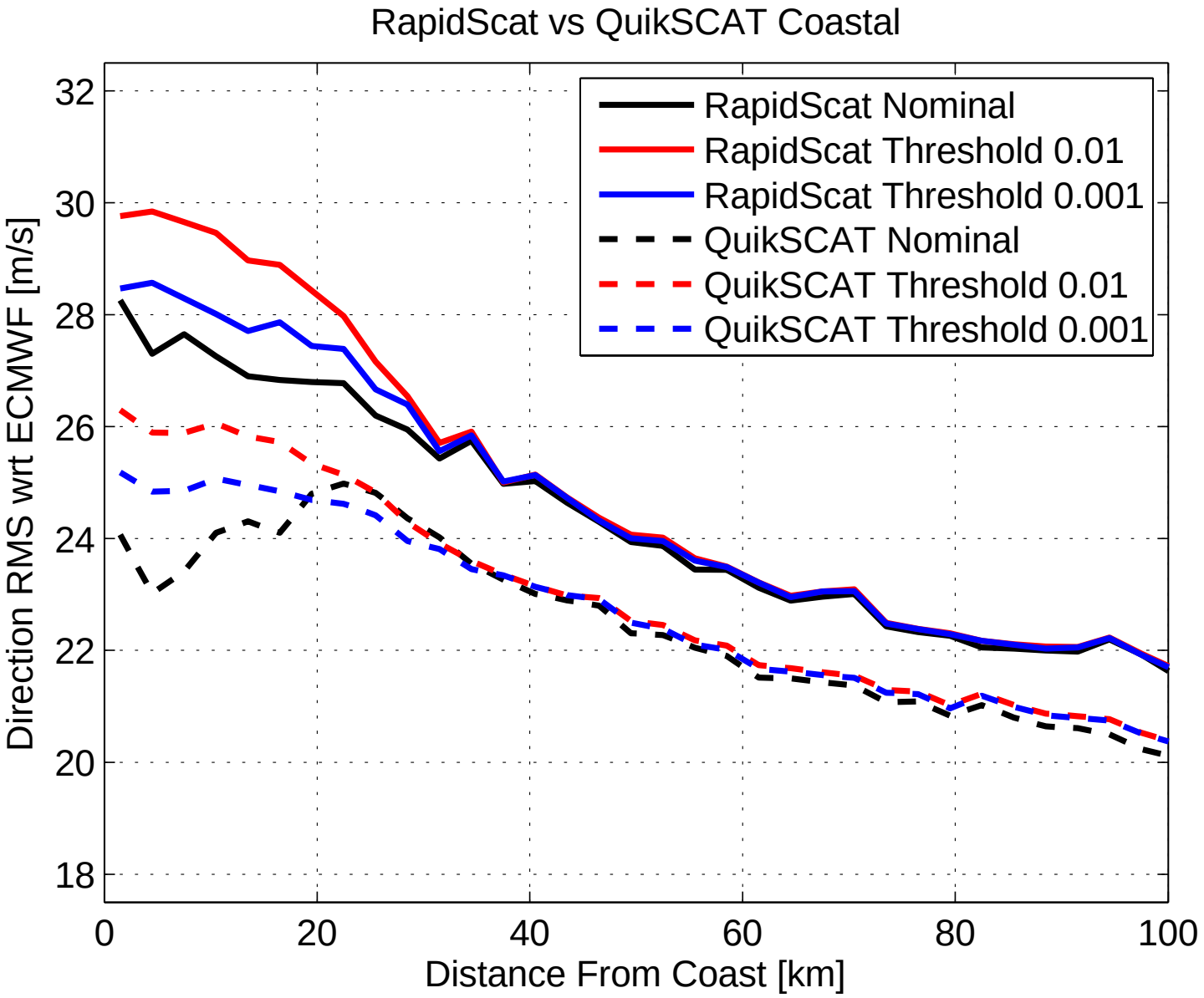
LCR Results: Speed Bias vs ECMWF



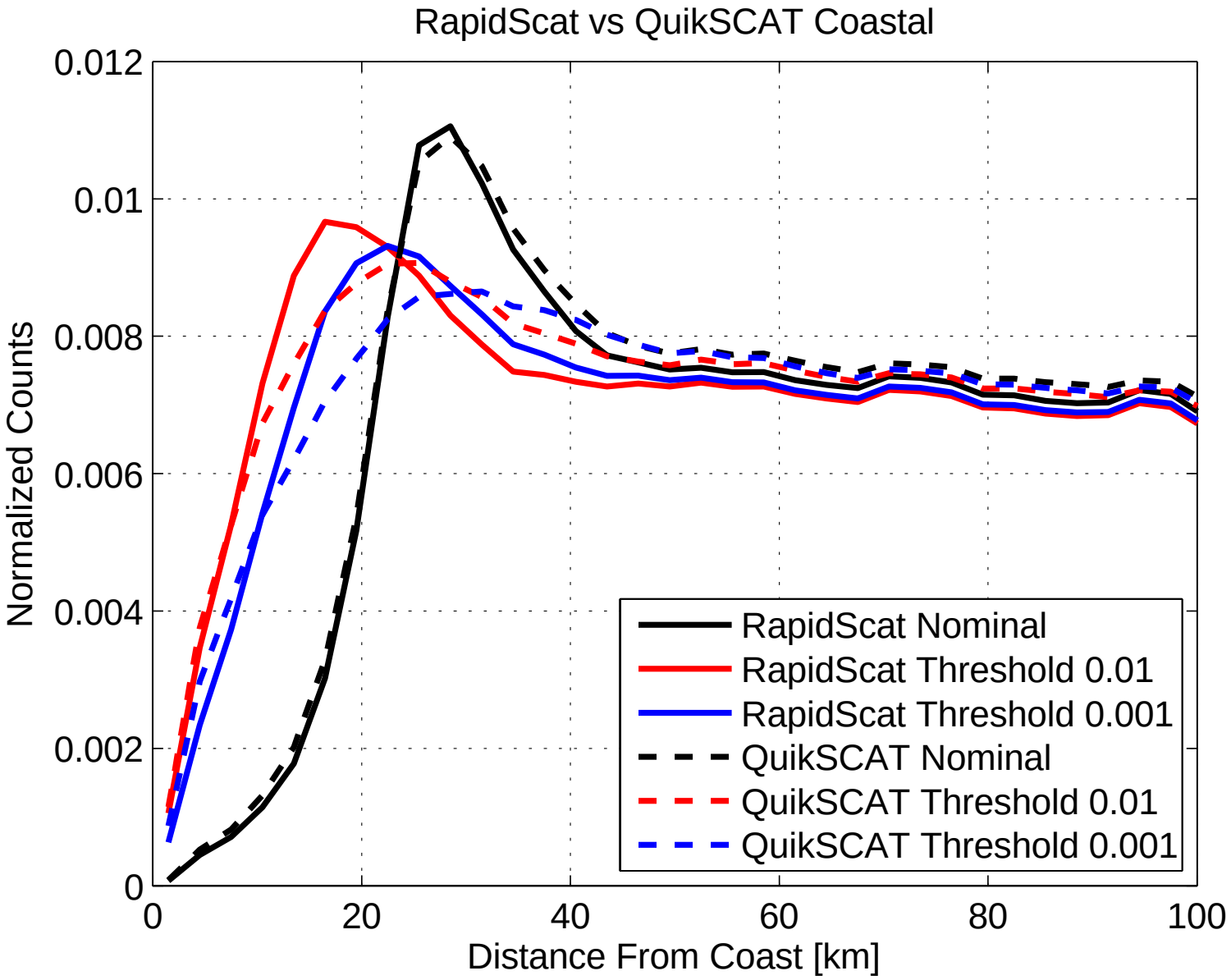
LCR Results: Speed STD vs ECMWF

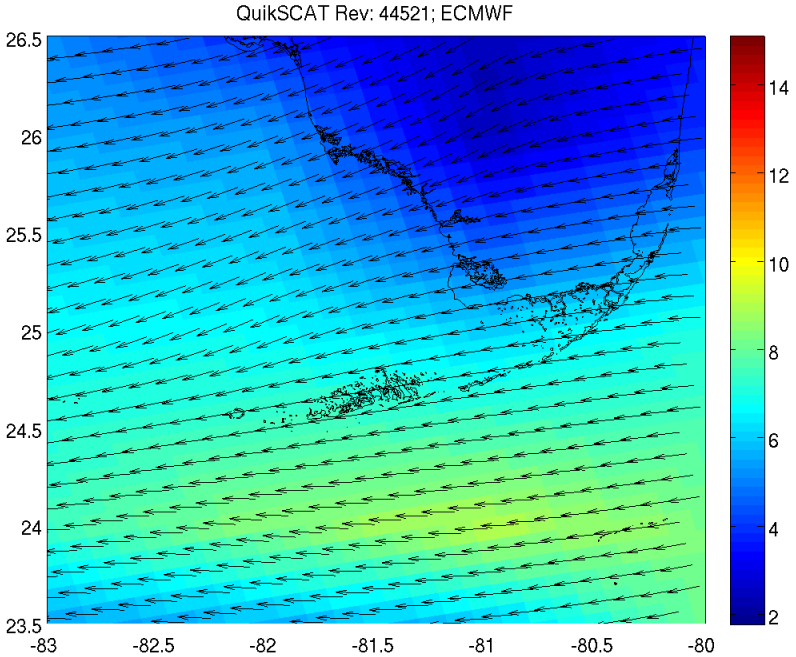


LCR Results: Direction STD vs ECMWF



Number of Retrieved Wind Cells

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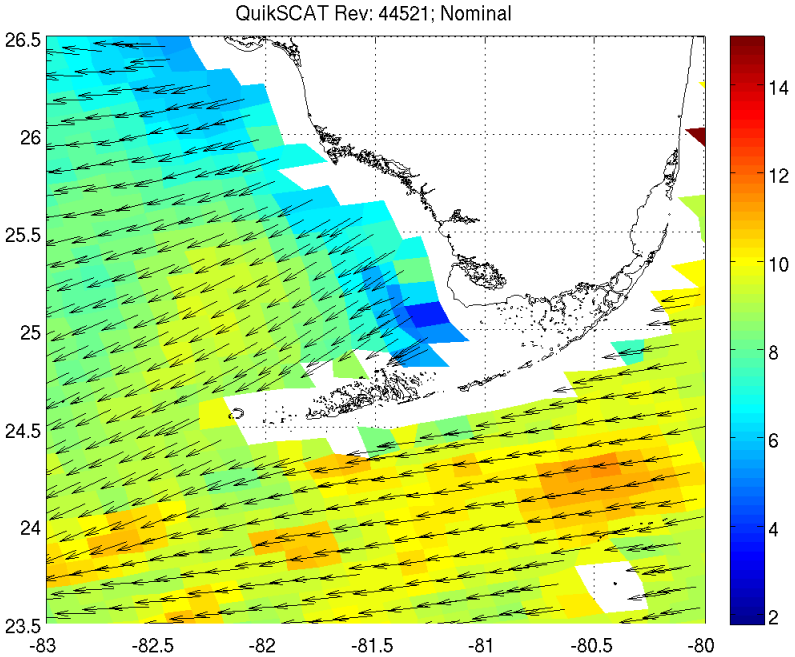
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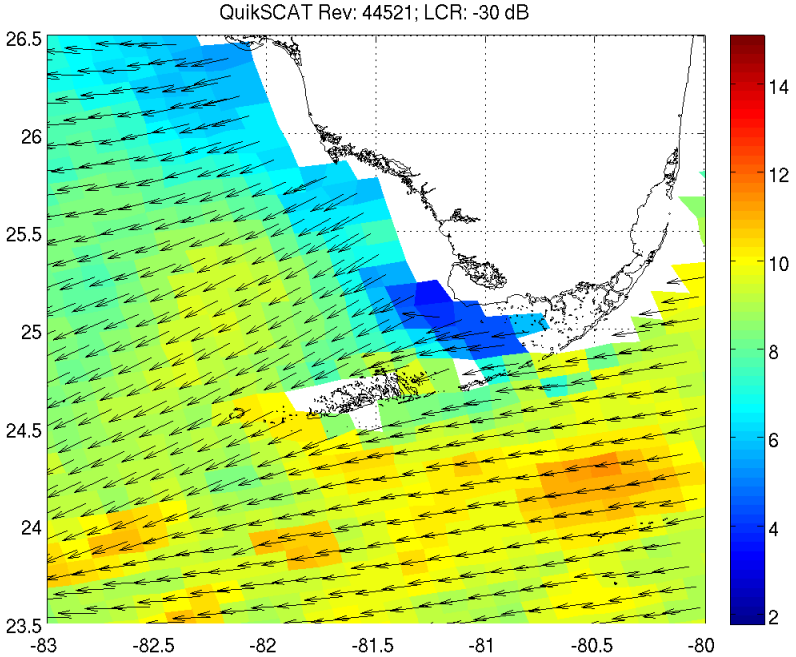
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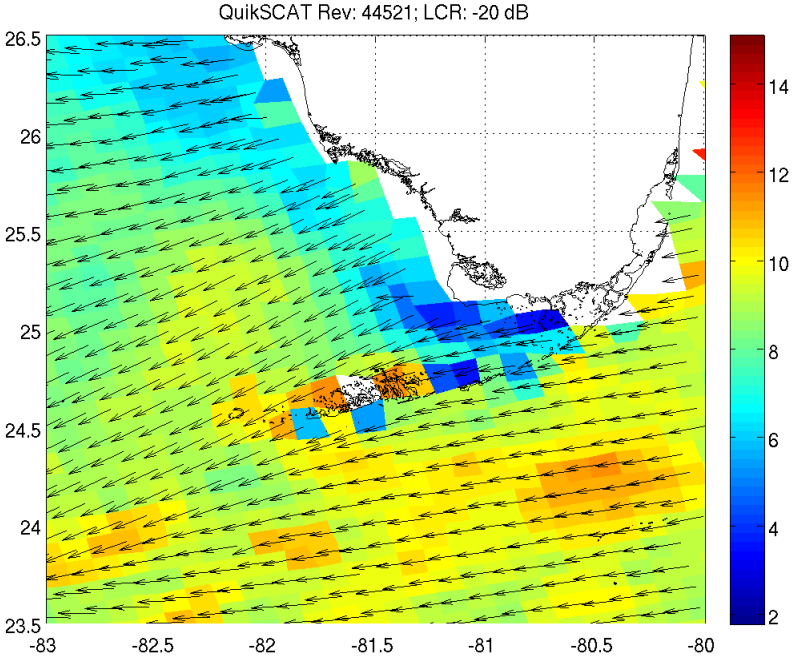
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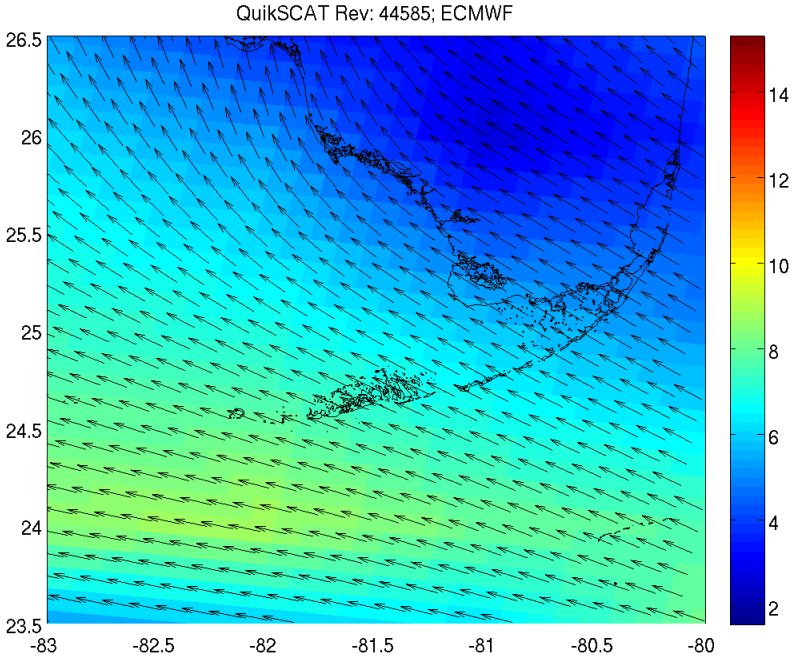
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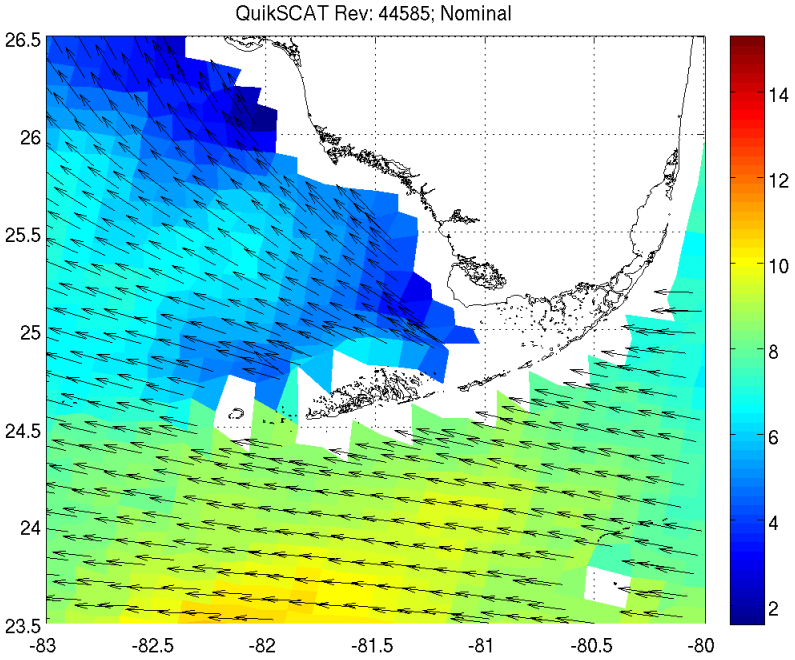
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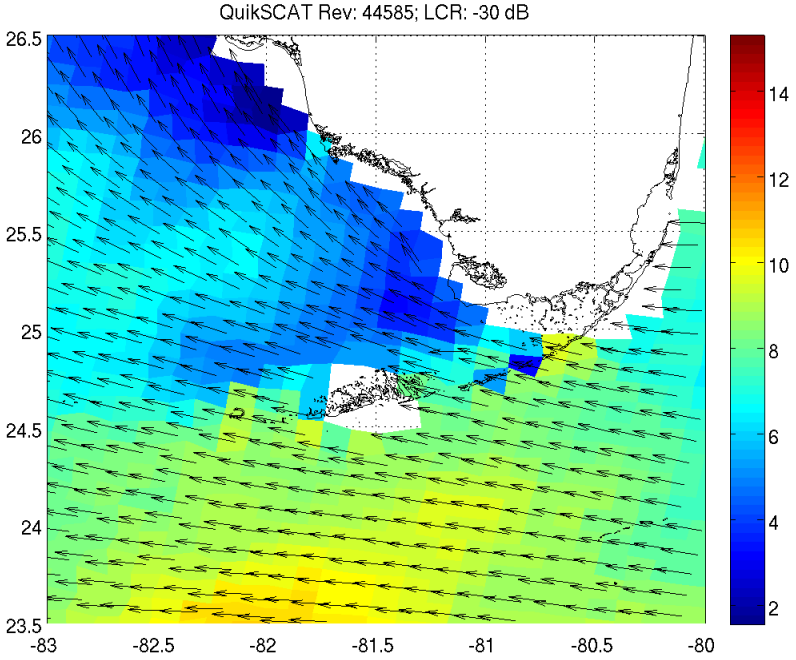
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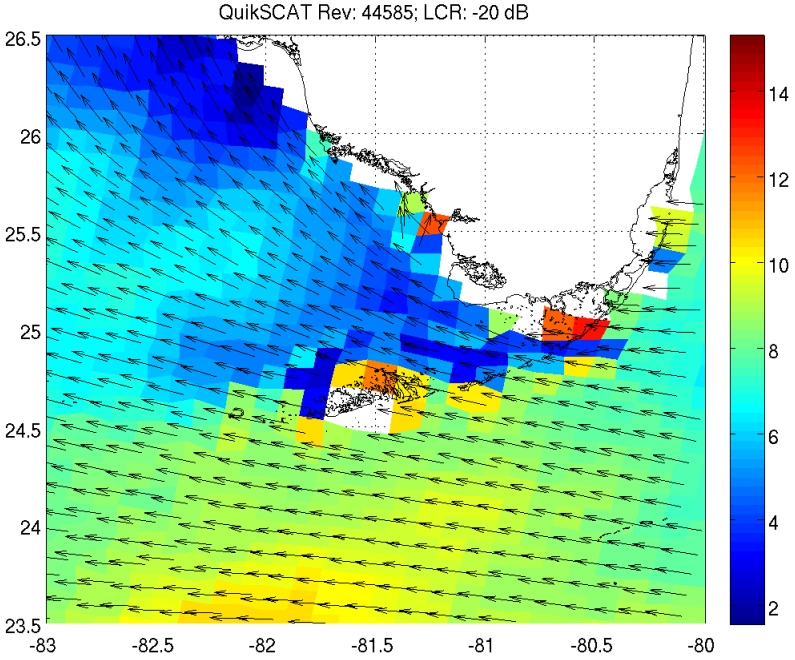
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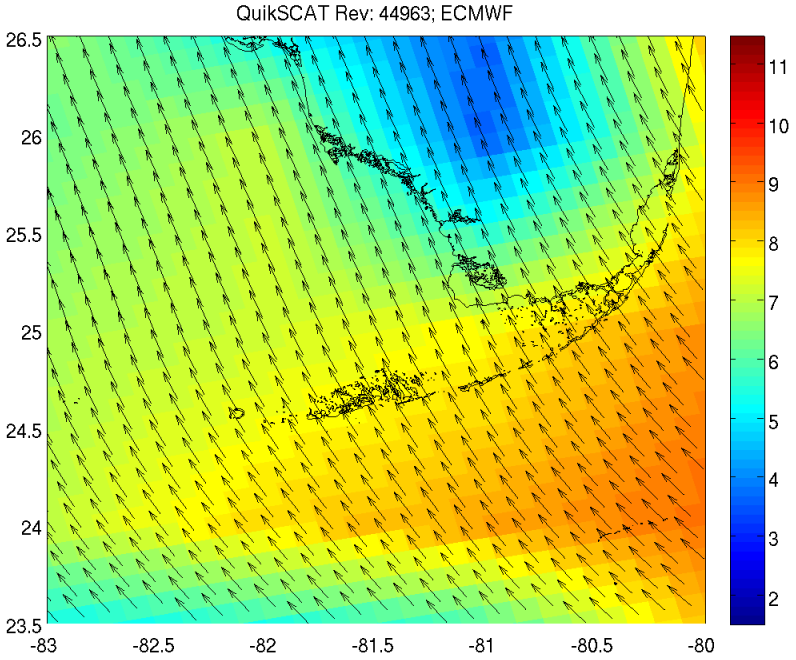
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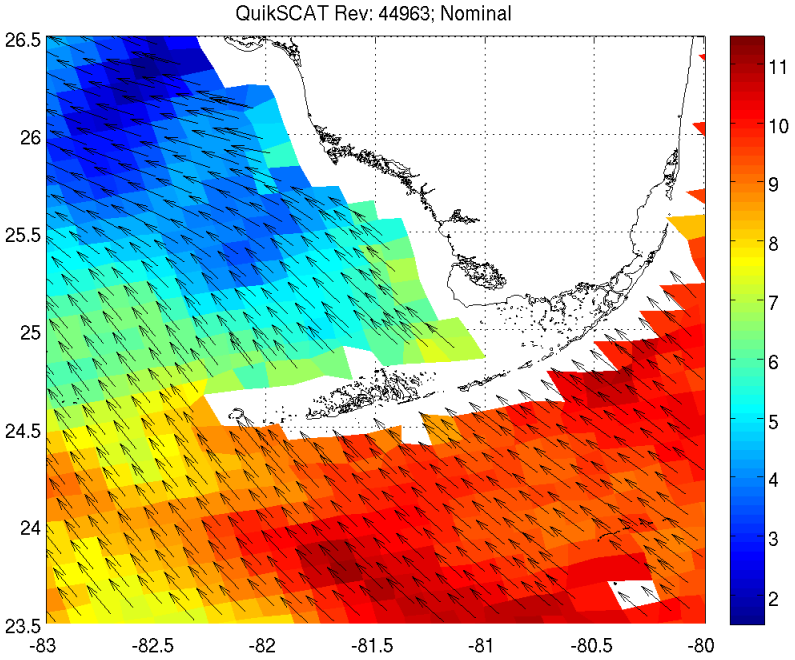
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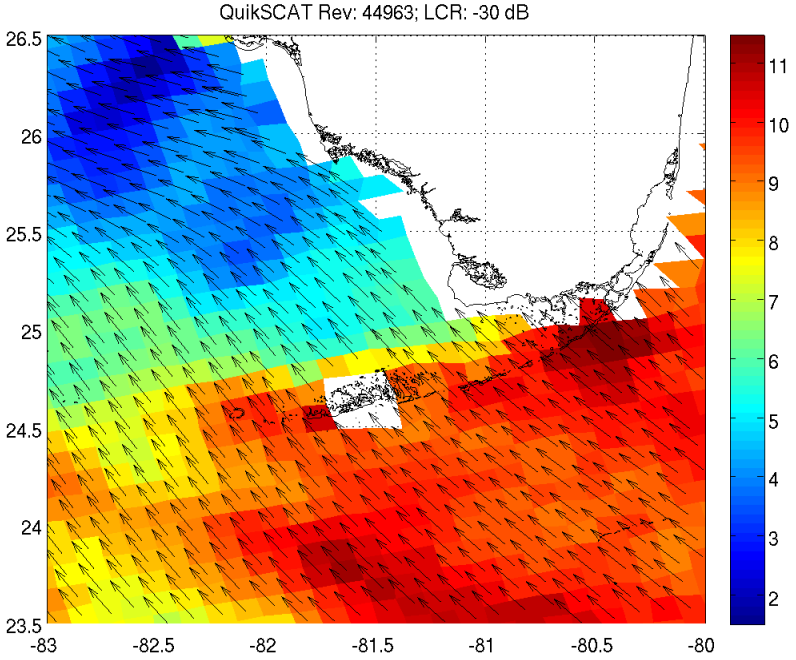
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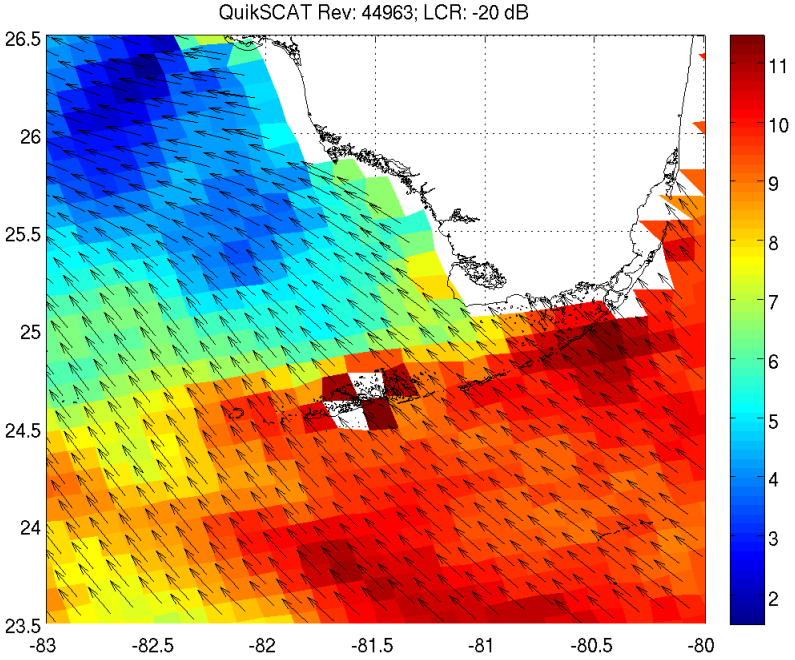
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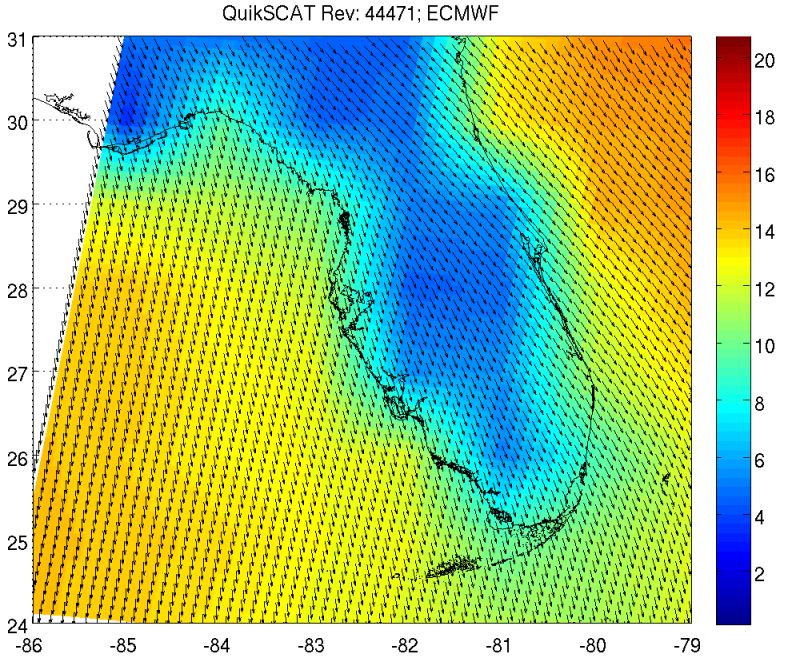
Coastal Study Conclusions

- LCR method works well for QuikSCAT indicating conservative LCRES methods will work better.
  - Obtains wind retrievals significantly closer to the coast
  - Minimal increase in errors w.r.t ECMWF in near coast data as compared to open ocean.

- RapidScat coastal processing is still needs work
  - Refine slice spatial response estimation
    - Improve antenna pattern translation and scaling
  - Examine geolocation and echo-tracking algorithms for potential errors.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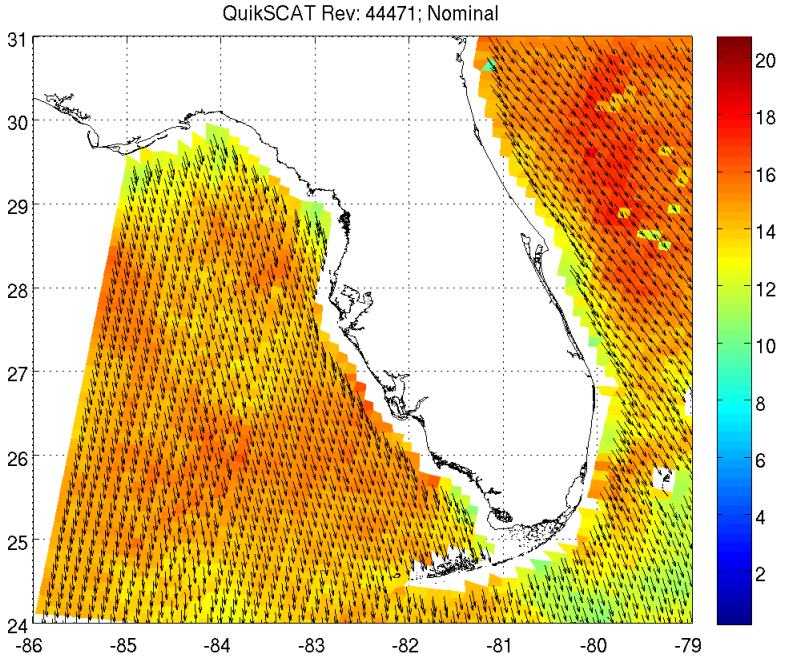
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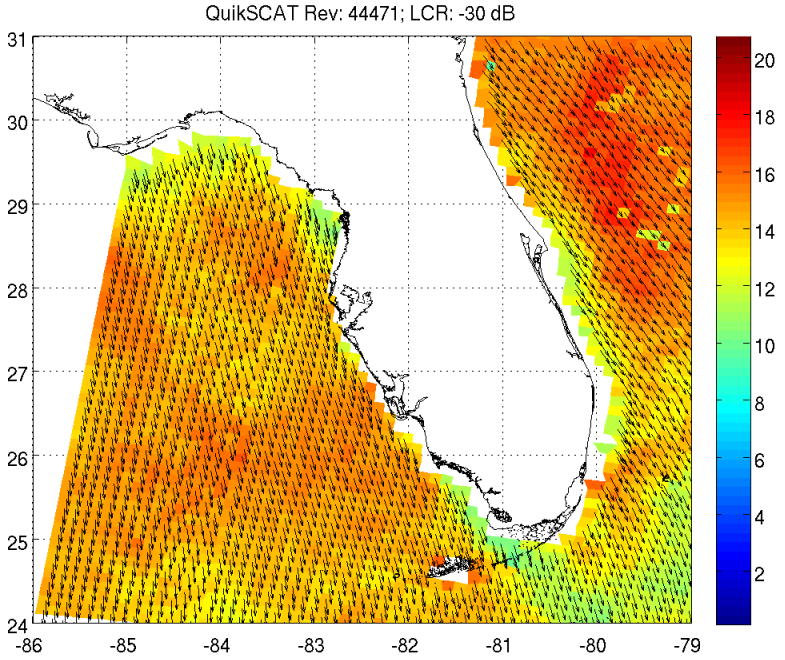
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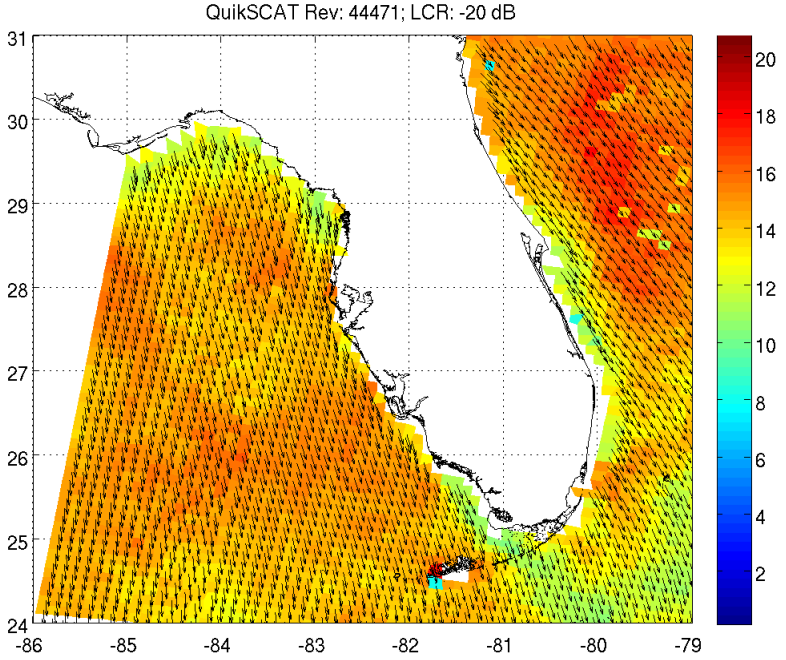
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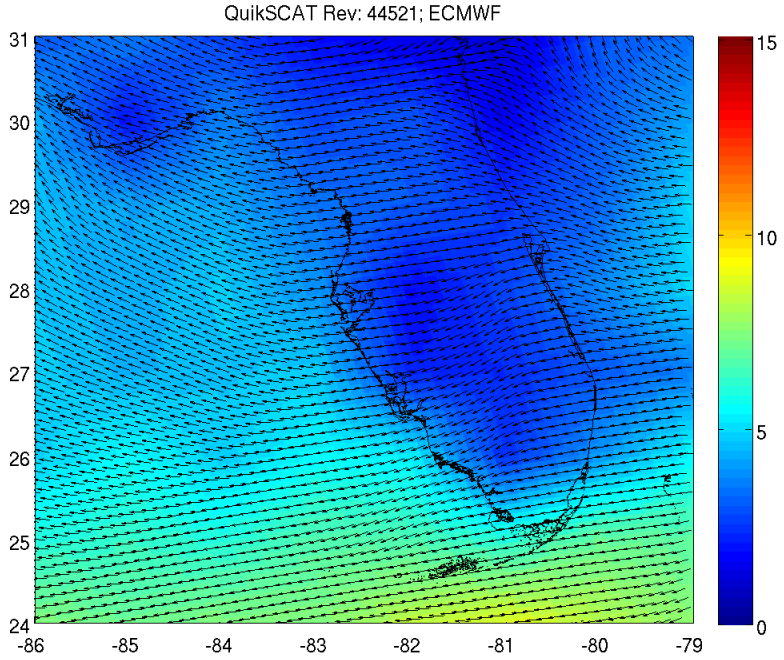
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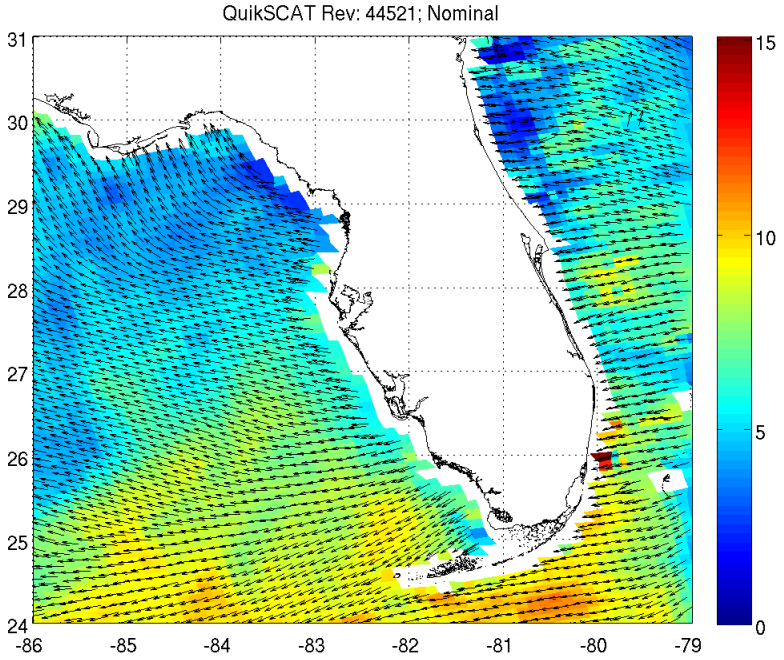
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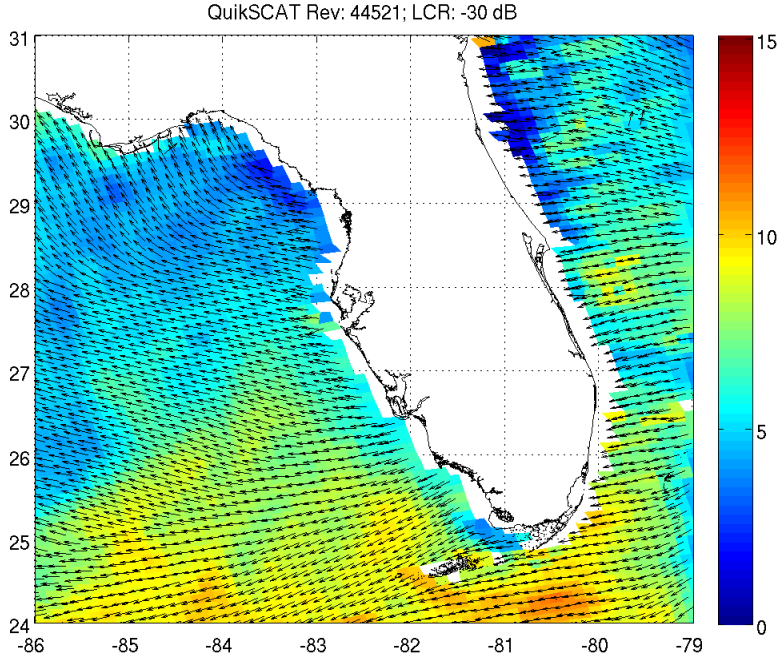
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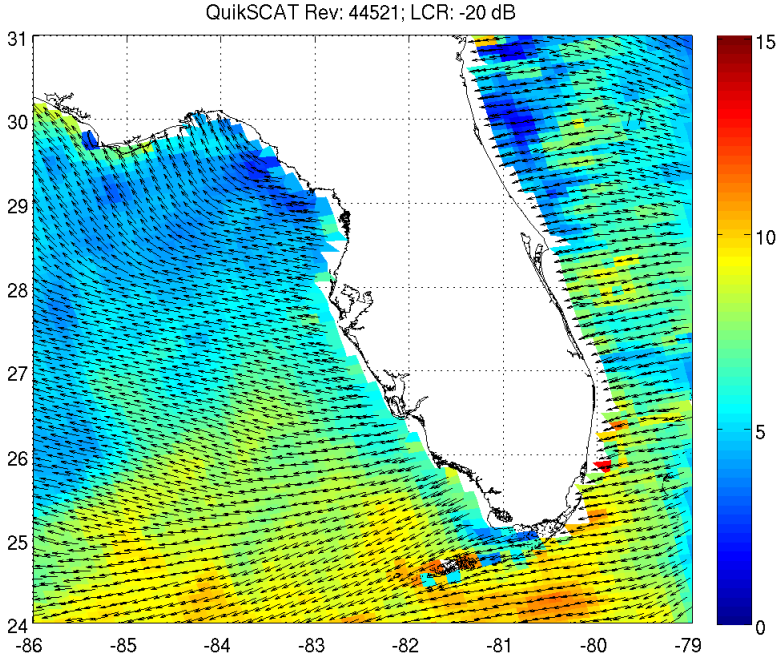
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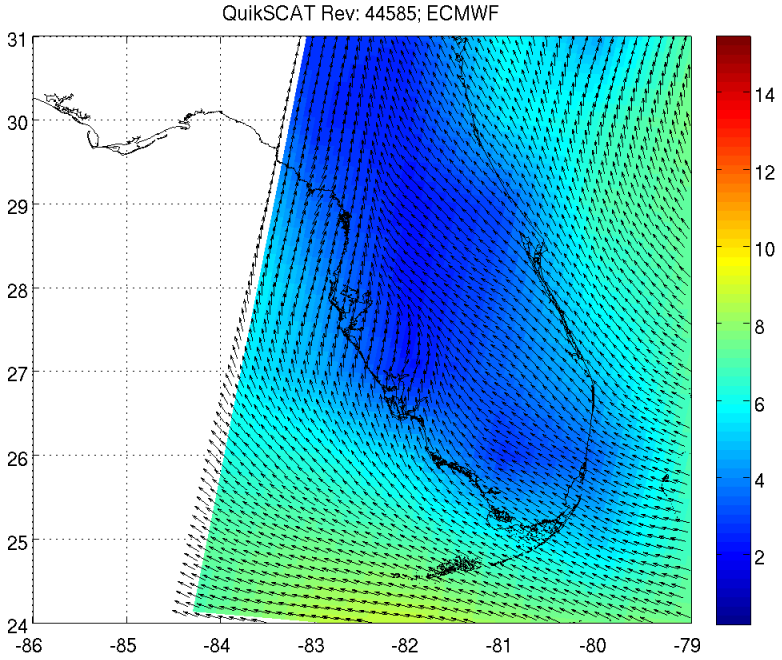
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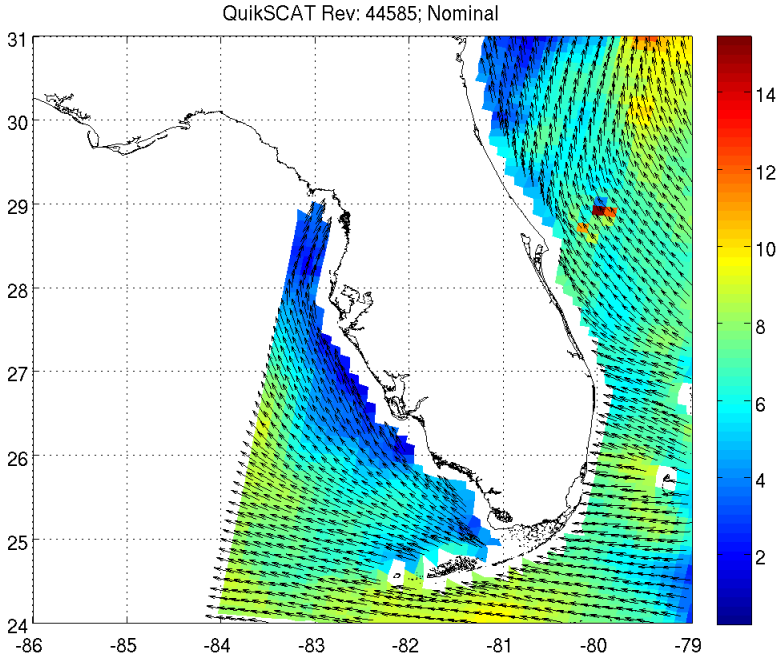
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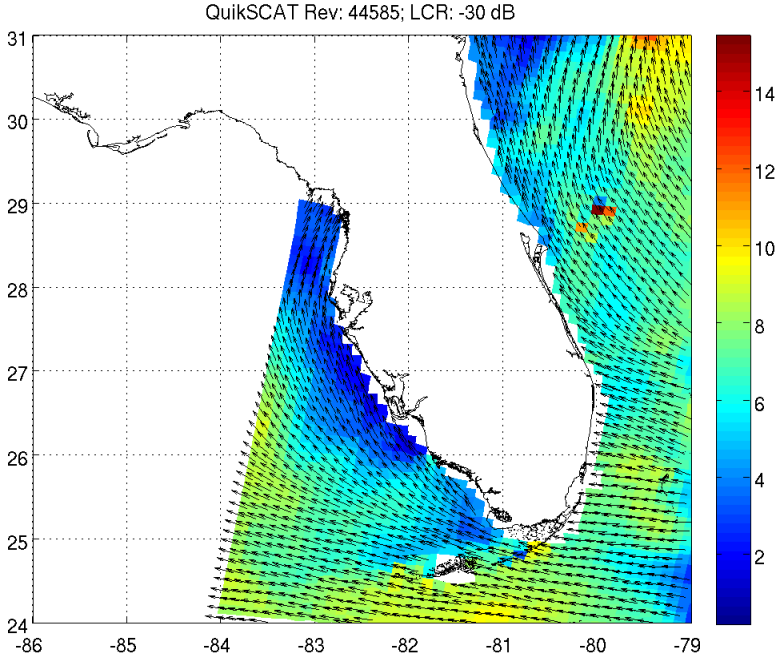
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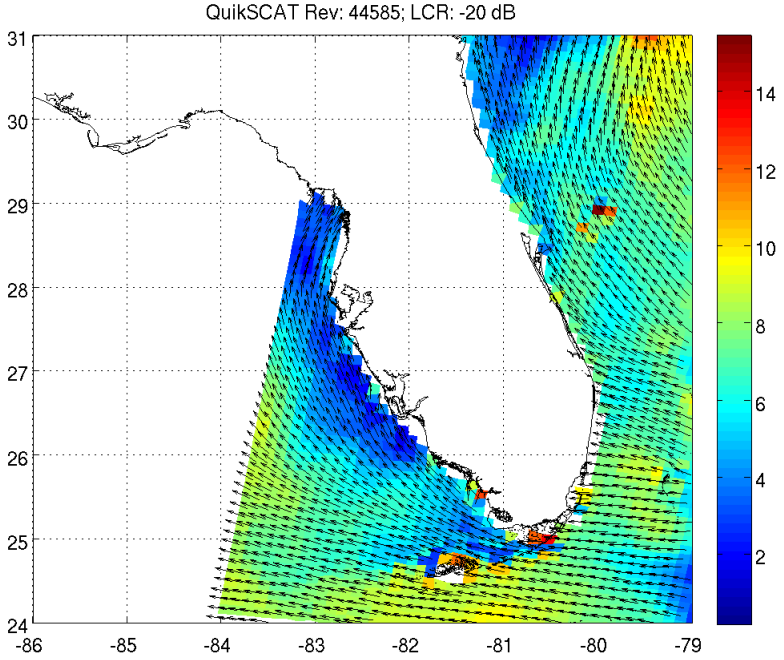
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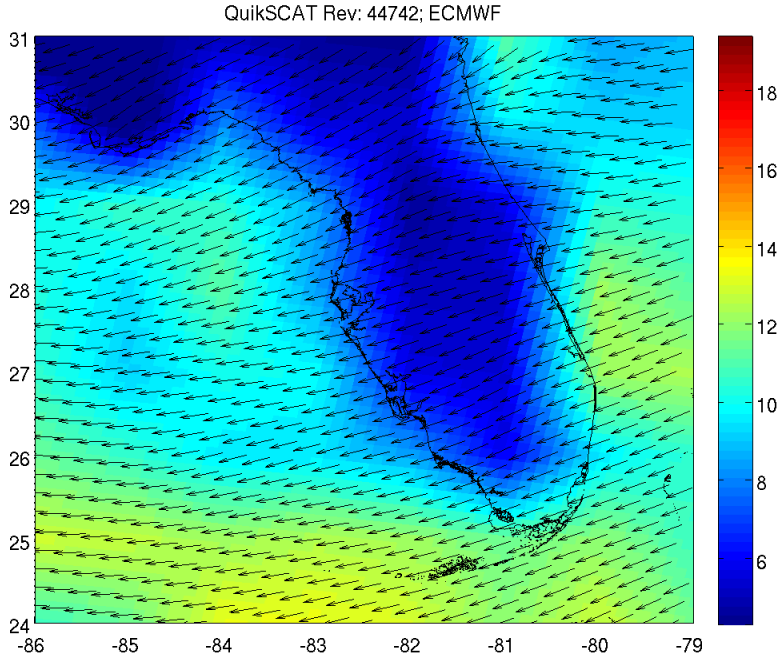
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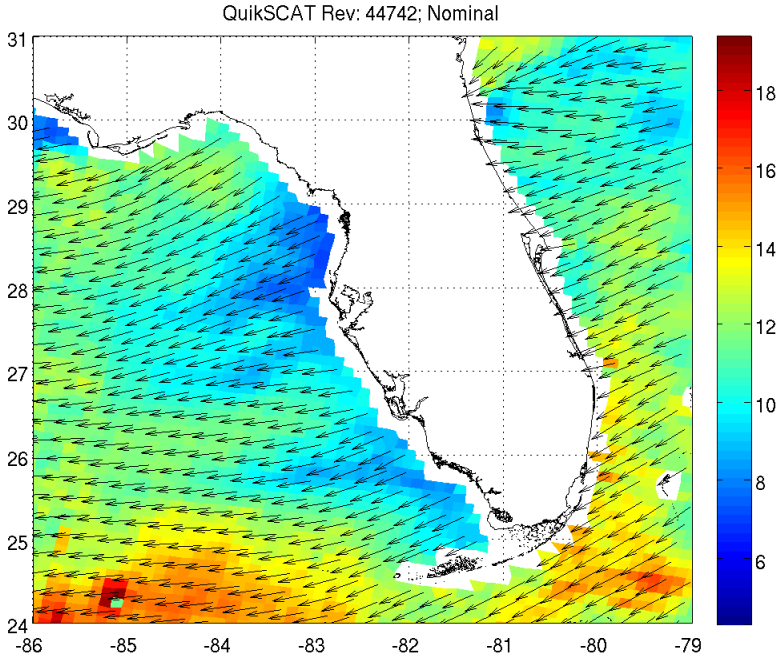
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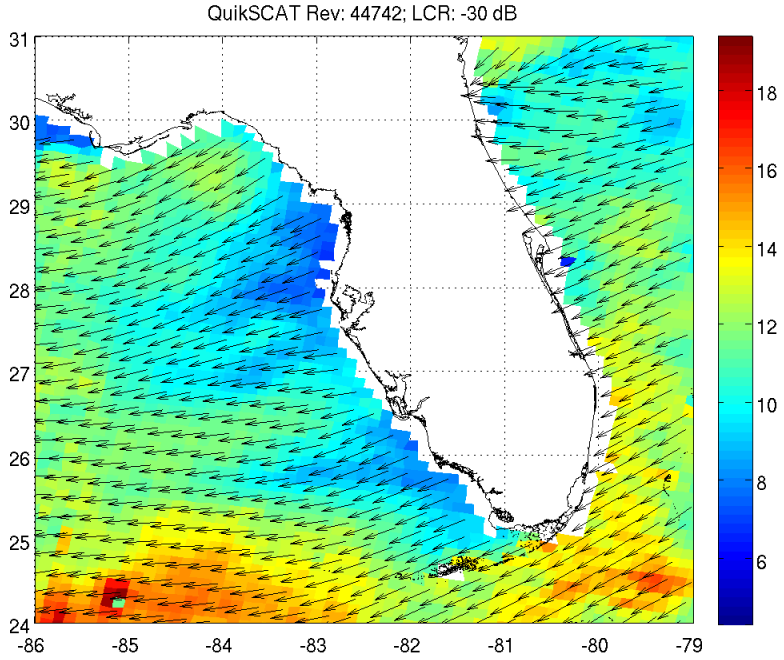
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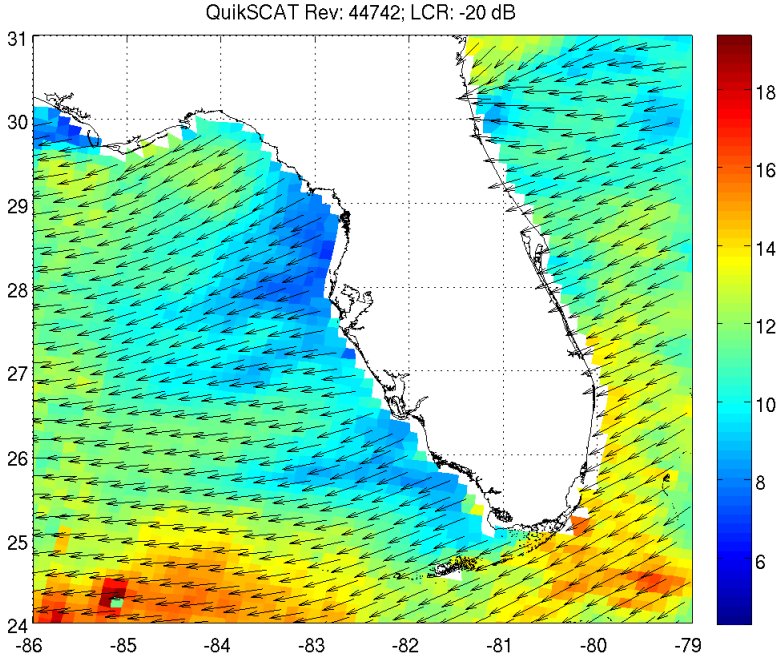
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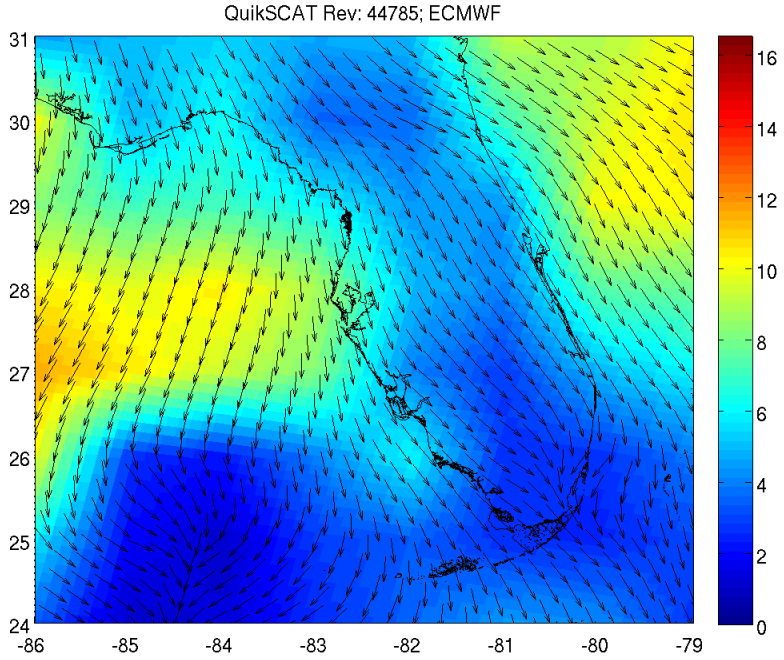
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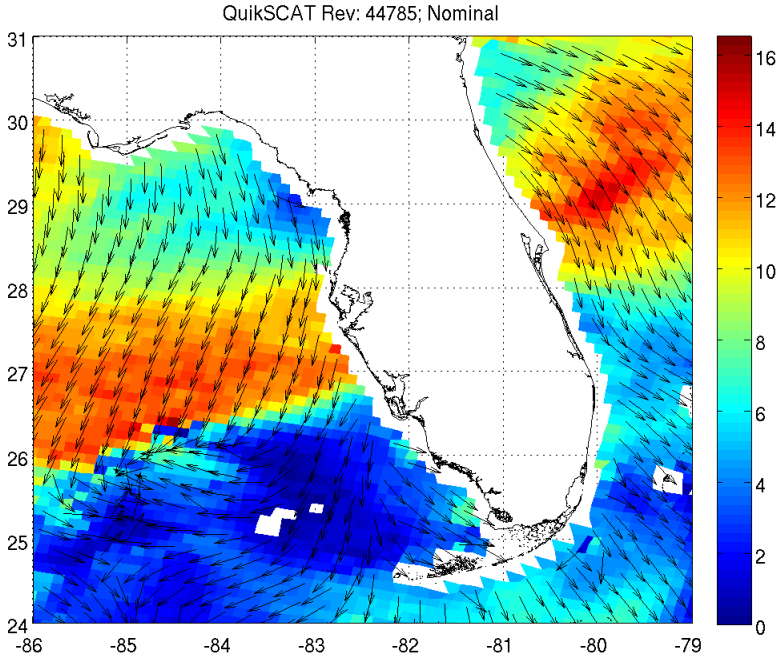
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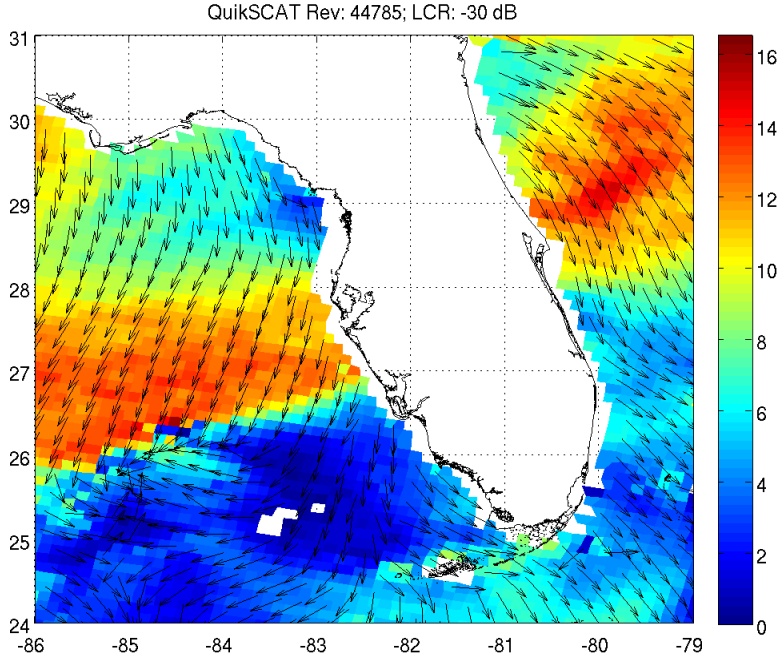
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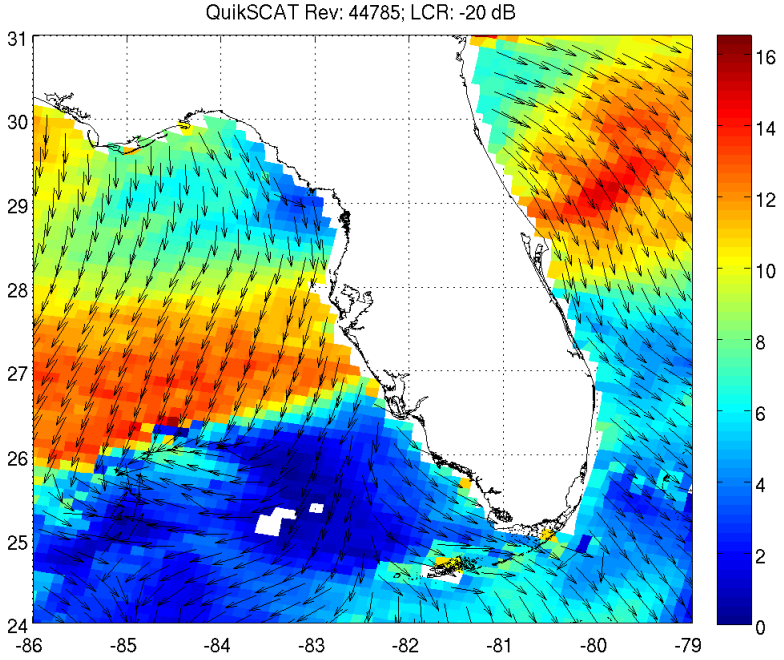
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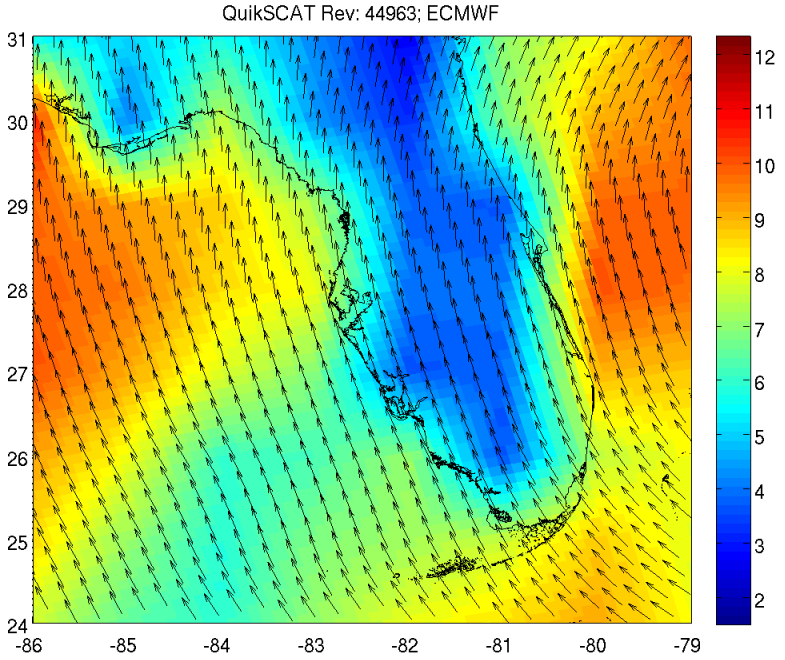
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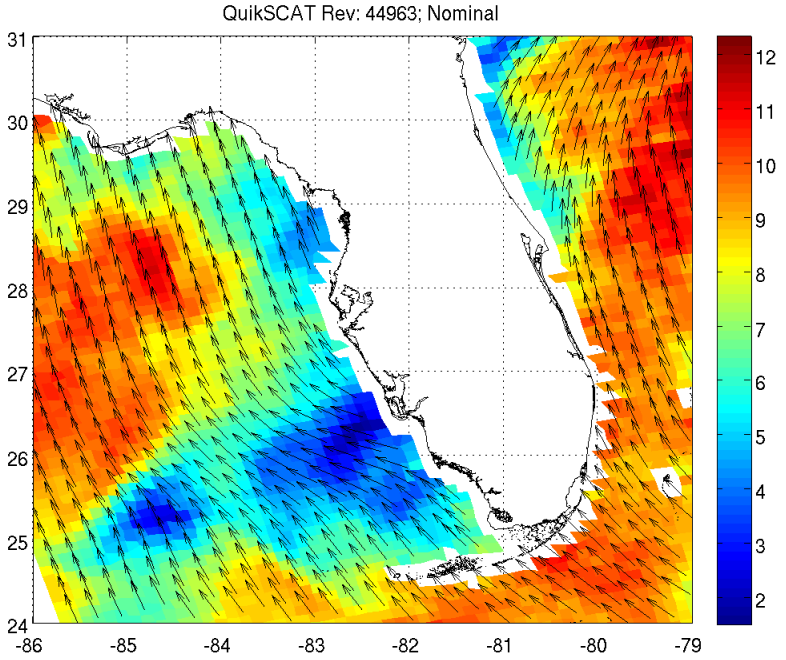
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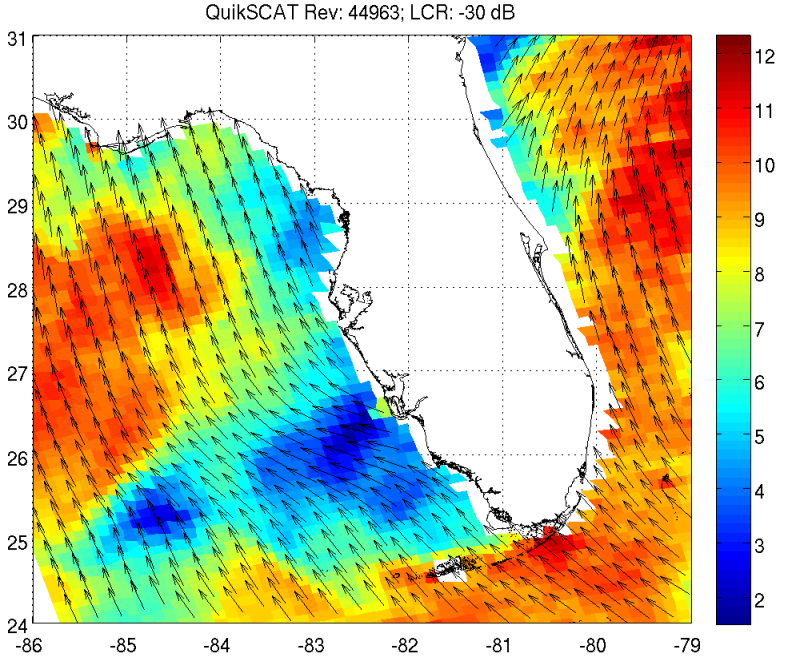
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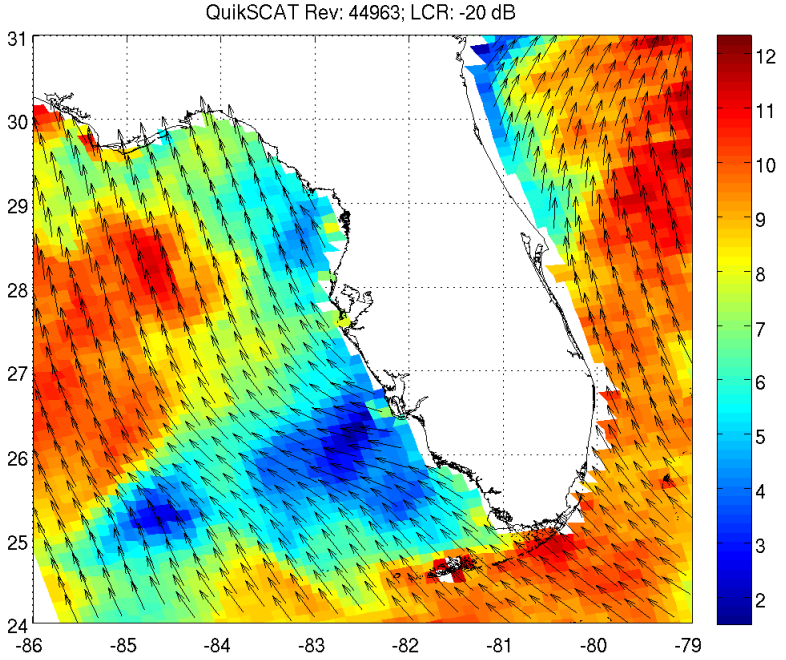
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