JPL Real-Time QuikSCAT Wind Fields

0.5°x0.5°x12-hr Wind Fields Generated by the Method of Successive Corrections

Vector Wind and Wind Speed

April 15, 2000
JPL Real-Time QuikSCAT Wind Fields

0.5°x0.5°x12-hr Wind Fields Generated by the Method of Successive Corrections

Wind Vorticity

April 15, 2000
JPL Real-Time QuikSCAT Wind Fields

0.5°x0.5°x12-hr Wind Fields Generated by the Method of Successive Corrections

Wind Divergence

April 15, 2000
Sampling Errors in Wind Fields Constructed from Single and Tandem Scatterometer Datasets

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Overriding Principle:

*Information cannot be created where information does not exist*
Example Maps of RMS Errors of Meridional Wind Estimates

2° by 2° by 4-day Smoothing

Day 40

(c) ASCAT
(d) QuikSCAT

(e) SeaWinds/ASCAT
(f) QuikSCAT/SeaWinds

Error (m/s)
Example Maps of RMS Errors of Meridional Wind Estimates
$2^\circ$ by $2^\circ$ by 4-day Smoothing

Day 40

(c) ASCAT

(d) QuikSCAT

(e) SeaWinds/ASCAT

(f) QuikSCAT/SeaWinds

Day 42

(c) ASCAT

(d) QuikSCAT

(e) SeaWinds/ASCAT

(f) QuikSCAT/SeaWinds

Error (m/s)

0.0 0.5 1.0 1.5 2.0 2.5 3.0
Time Series of RMS Errors of Meridional and Zonal Wind Estimates
2° by 2° by 4-day Smoothing

Solid lines:
Meridional velocity with 3 variants of spatial autocorrelation function and 2° by 2° by 4-day smoothing

Dotted lines:
Zonal velocity with 2° by 2° by 4-day smoothing

Thin solid line in panel (d):
Meridional velocity with 2° by 2° by 1.5-day smoothing
Dependencies of Mean and Standard Deviation of Mapping Errors on Spatial and Temporal Smoothing

for QuikSCAT and Tandem QuikSCAT/SeaWinds

Note that errors are more sensitive to temporal smoothing than to spatial smoothing. This is an indication that mapping errors are dominated by temporal sampling.
Conclusions

• The mean revisit interval at midlatitudes decreases from about 16 hrs for QuikSCAT sampling to about 10 hrs for tandem QuikSCAT/ASCAT sampling.

• This characterization of scatterometer sampling is very misleading.
  – Because of the complexity of space-time sampling, mapping errors vary considerably geographically and temporally.
  – Mapping errors are largest between 20º and 30º latitude.

• Mapping errors can be reduced by increasing the spatial and/or temporal smoothing, with a concomitant loss of resolution.
  – Errors are substantial even in 3ºx3ºx12-day smoothed fields (analogous to 2ºx2ºx7-day block averages)
Two Examples of **NSCAT** Sampling Errors with 2° by 2° by 4-day Smoothing

- Note the area of 6-10 m/s errors in the southwest corner!
- Note patchy areas of more than 4 m/s errors

![Diagram showing wind speed](image)
Assumptions for a Statistical Analysis of Sampling Errors

1) Global average standard deviation of 5 m/s for each wind component

2) Note the shorter decorrelation time scale for $v$ than for $u$

3) Spatial Correlation Functions

4) Global average standard deviation of 5 m/s for each wind component
Percent Sampling Coverage as a Function of Latitude and Time Interval

Note the “bulge” of relatively poor sampling centered at about 25ºN
Time-Longitude Distributions of Measurements Along Selected Latitudes

(d) QuikSCAT

(f) QuikSCAT/SeaWinds