MODIS C6
Geolocation Status

MODIS Science Team Meeting
Plenary Session

April 15, 2013

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NASA GSFC Code 619

Geolocation C5/C6 results

Terra

- Excellent results –Root Mean Square Error (RMSE) in nadir equivalent units is better than accuracy goal
- Large errors occur ~1.5 hr after maneuvers (about 12 per year)
  - accuracy in following orbit suspect

Aqua

- Good results – RMSE is better than goal in track direction but slightly over goal in scan direction (but much better than specification – 150 m)
- Definitive ephemeris is used for best results – causes up to 24 hr processing delay

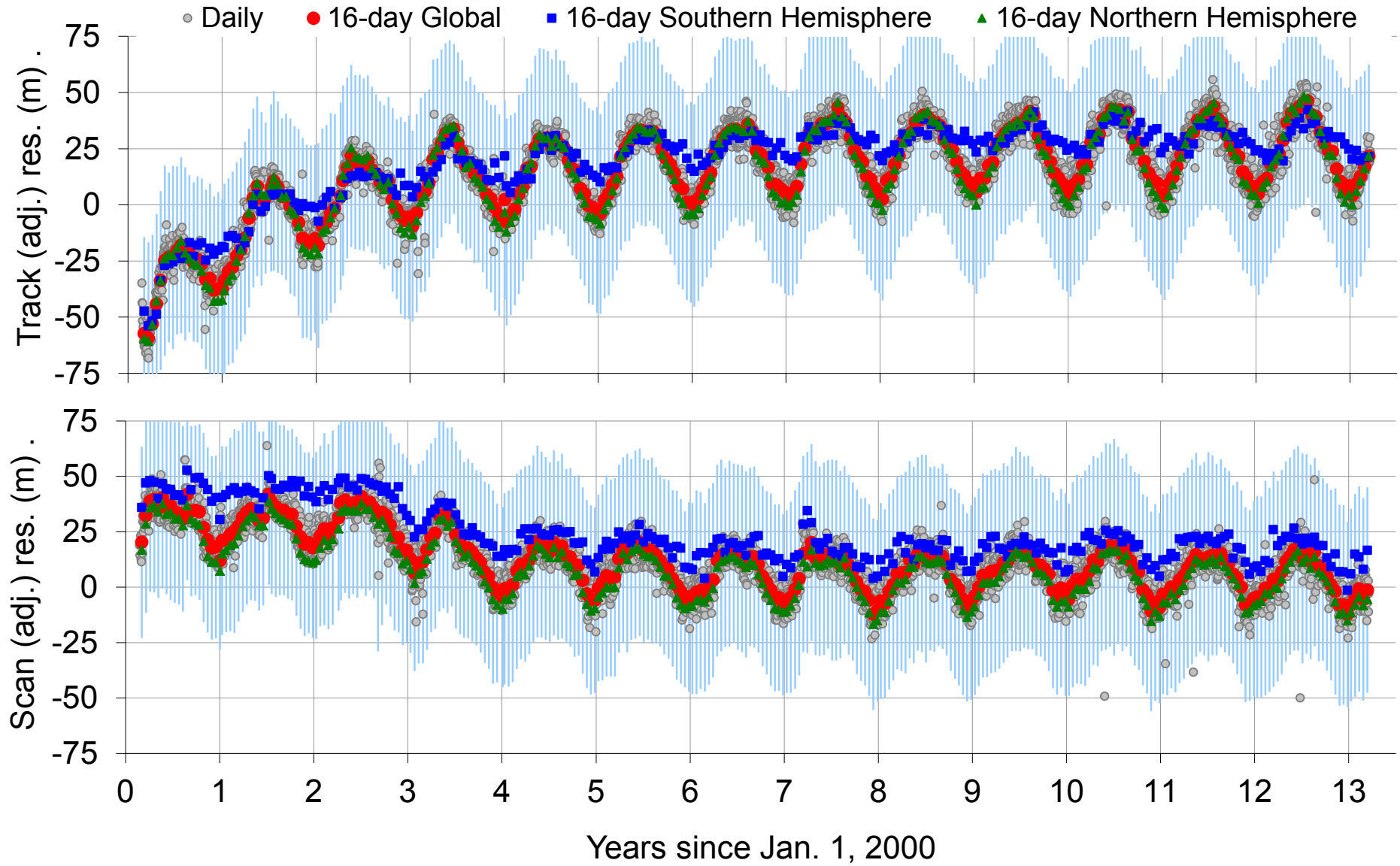|	Terra		Aqua	
	C5	C6	C5	C6
Along-track RMSE (m)	43	42	48	46
Along-scan RMSE (m)	44	42	53	51
Years of Data	13.1		10.7	
Ground Control Point Match-ups/day	263		227	

Note: These results are for MODIS Band 1, which is used in the control point matchup. Other bands must be offset by the band-offsets published by the MODIS calibration team.

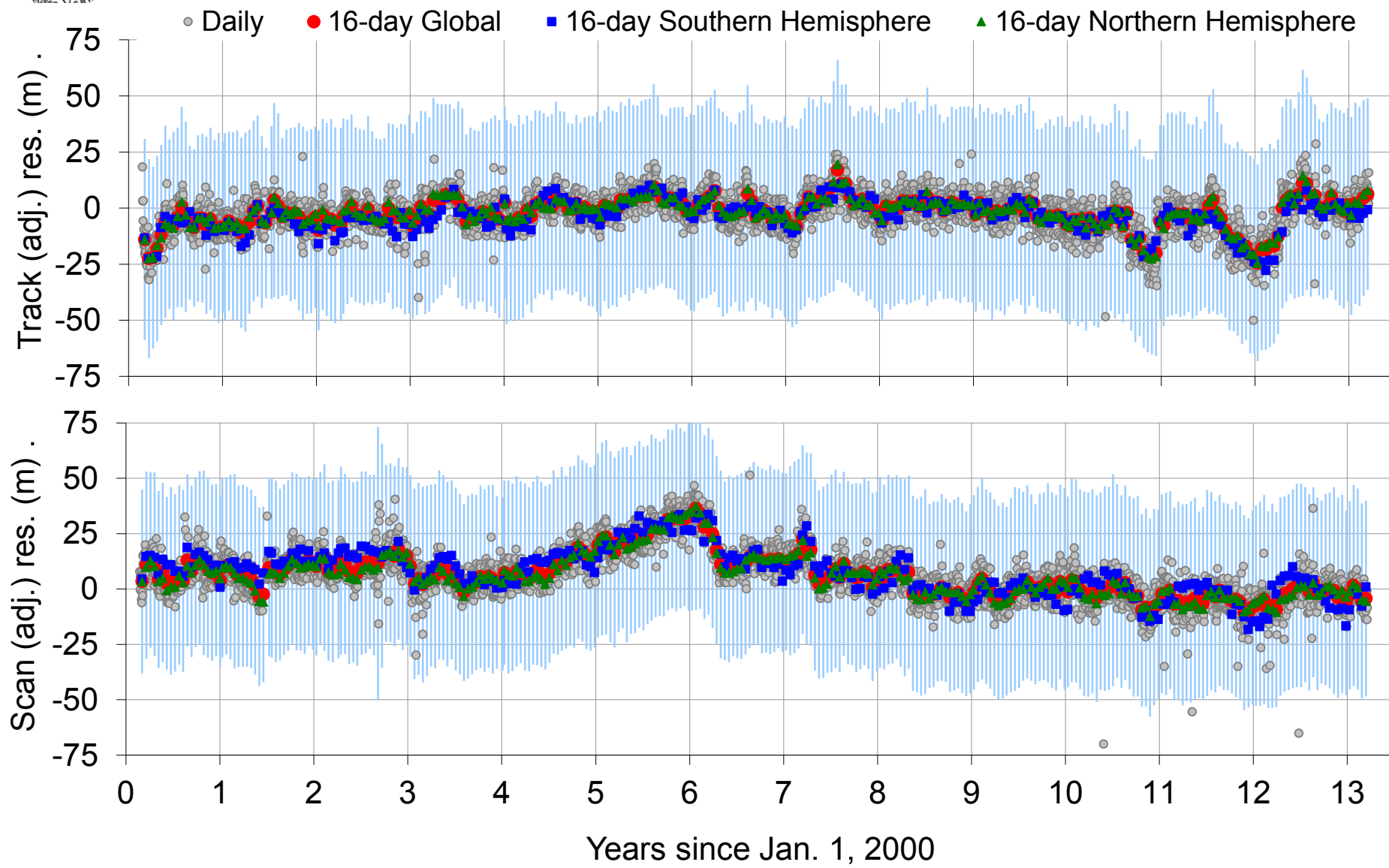# Terra trend and update details

Terra long-term trend (w/o correction)

Daily • 16-day Global ■ 16-day Southern Hemisphere ▲ 16-day Northern Hemisphere

Track (adj.) res. (m)

Scan (adj.) res. (m)

Years since Jan. 1, 2000

RMSE with no correction: Track: 49 m (+7 m vs C6)   Scan: 47 m (+5 m vs C6)
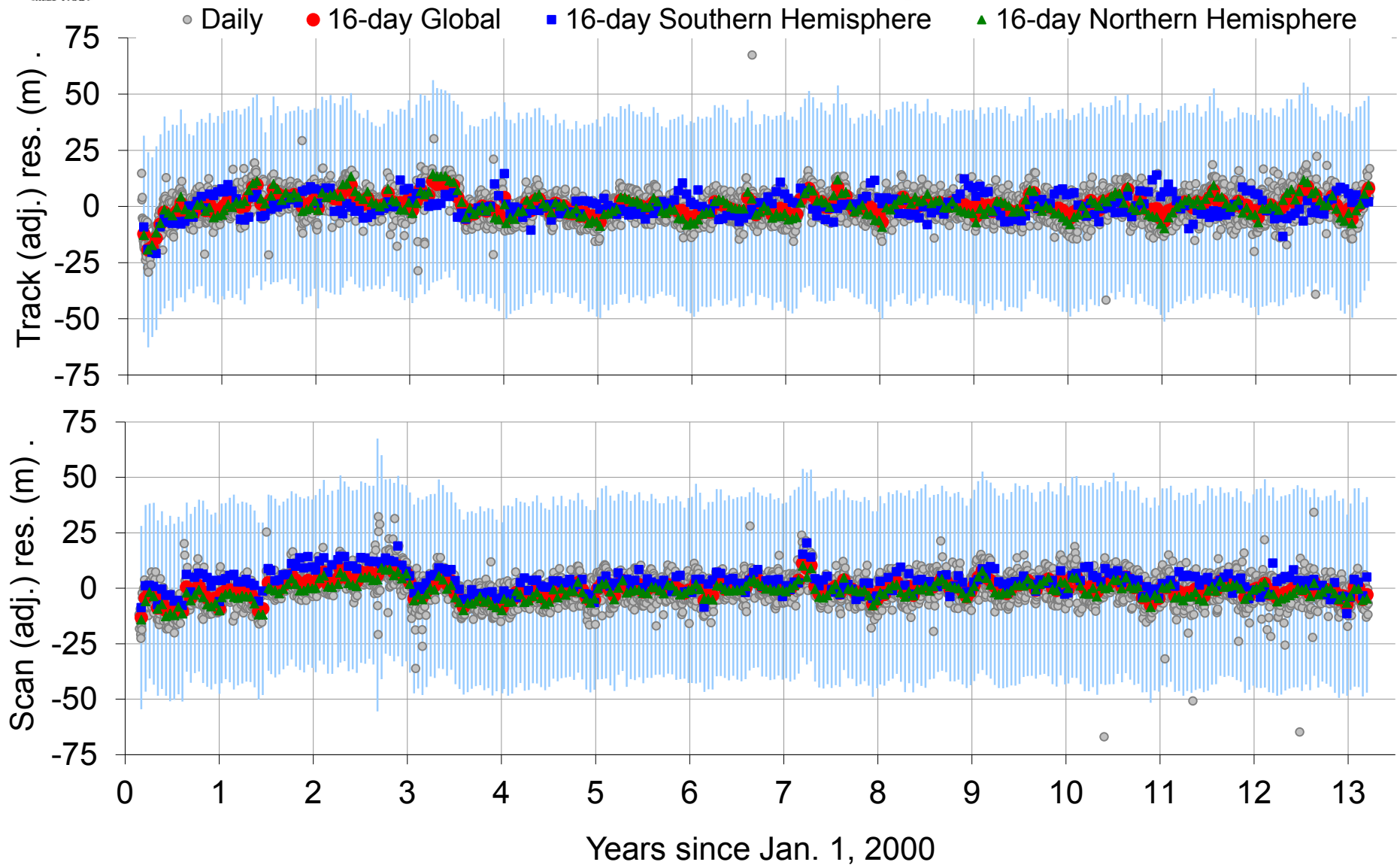
4

Actual Terra C5 residuals

C5 RMSE   Track: 43 m   Scan: 44 m
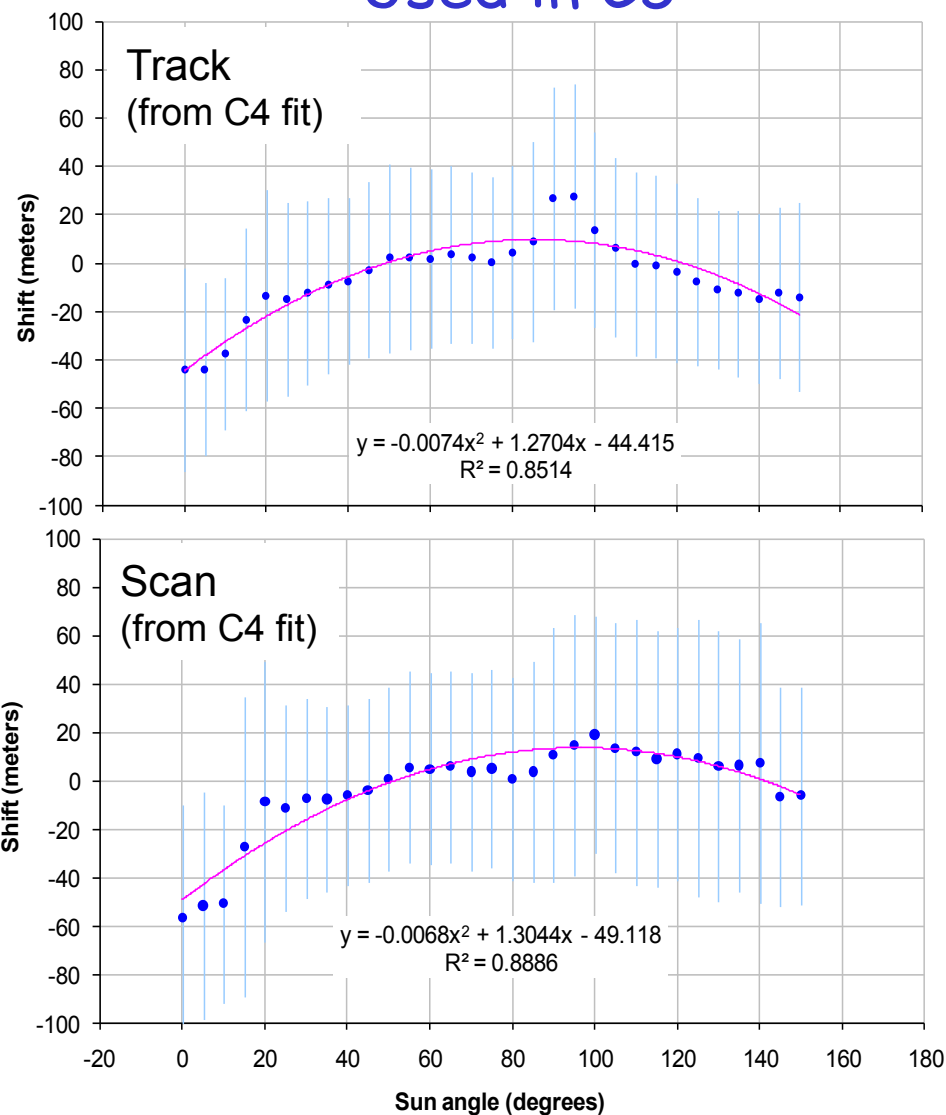
Terra C6 residuals (estimated)

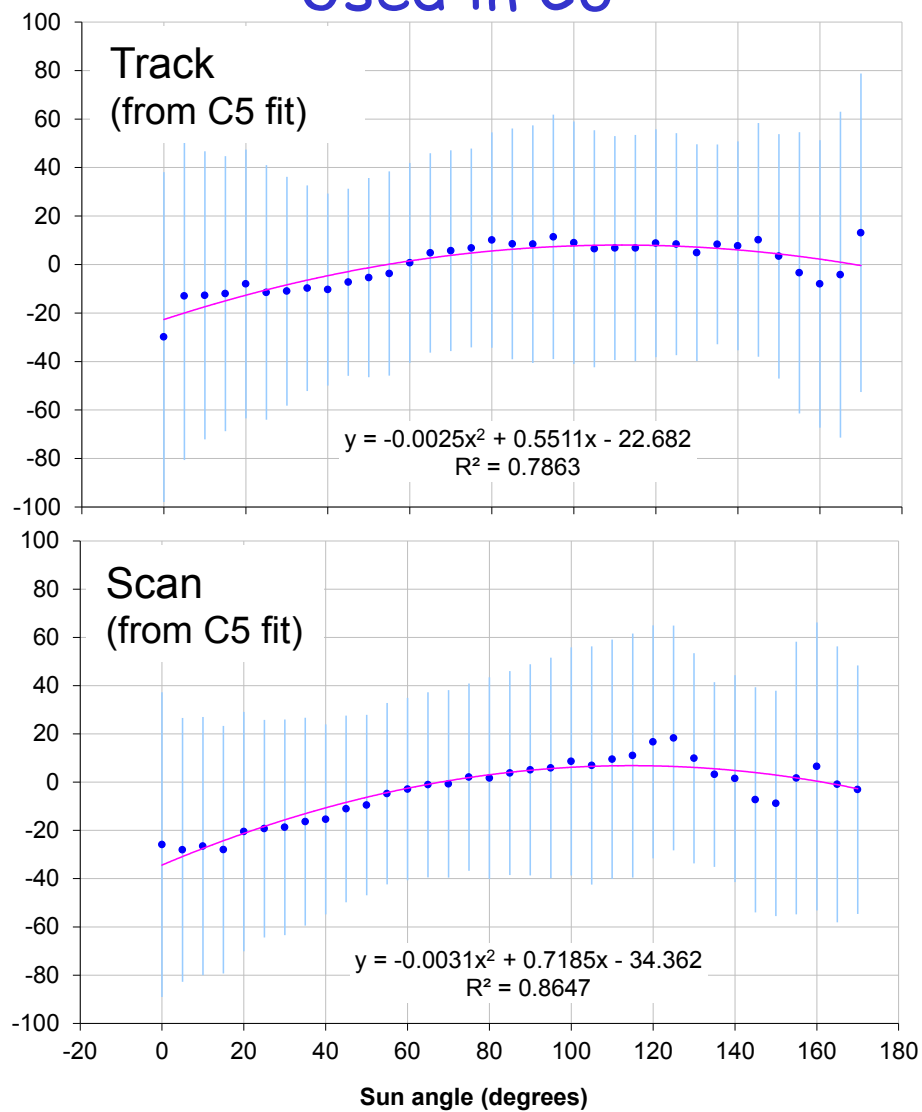C6 RMSE   Track: 42 m (-1 m vs C5)   Scan: 42 m (-2 m vs C5)
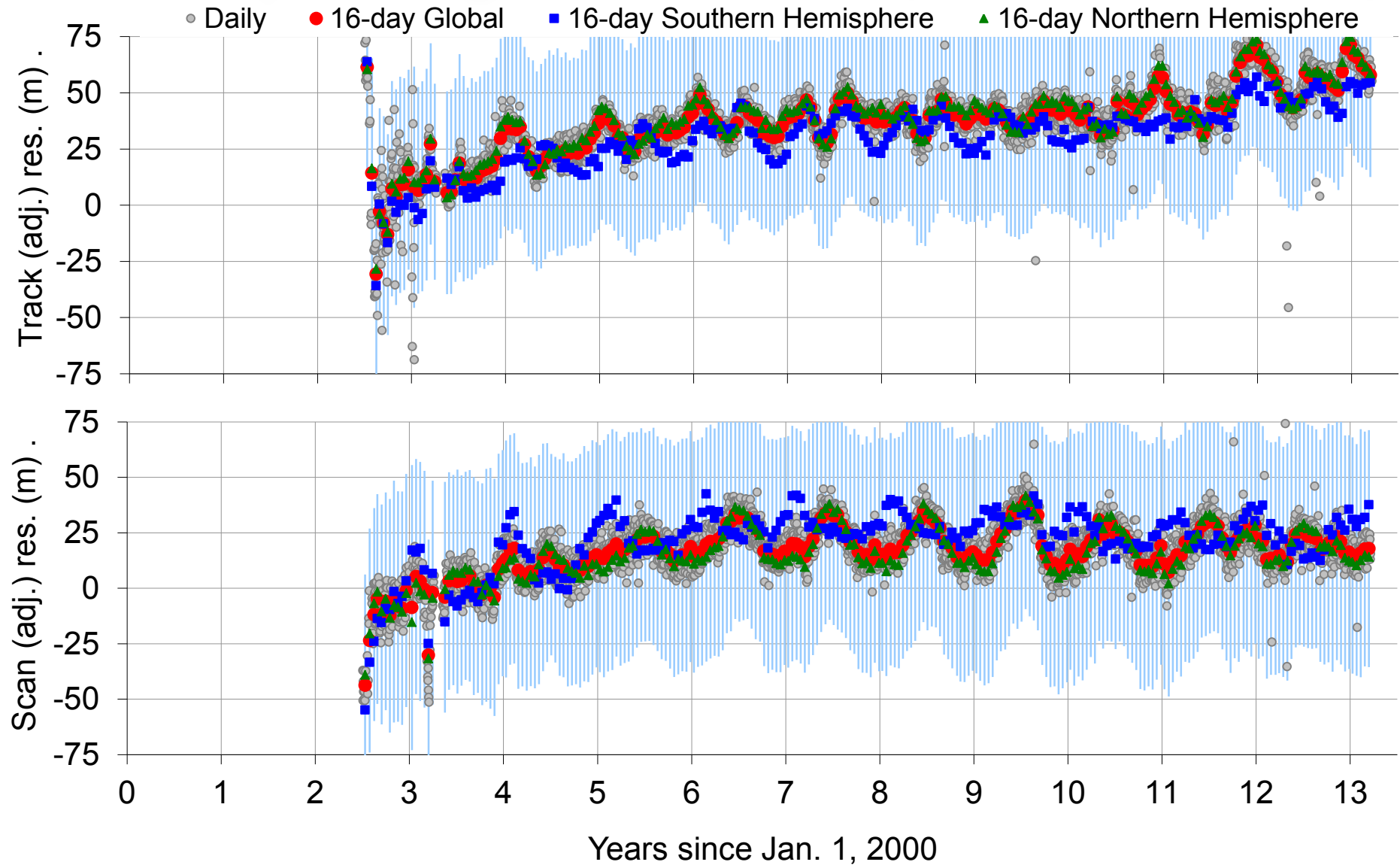
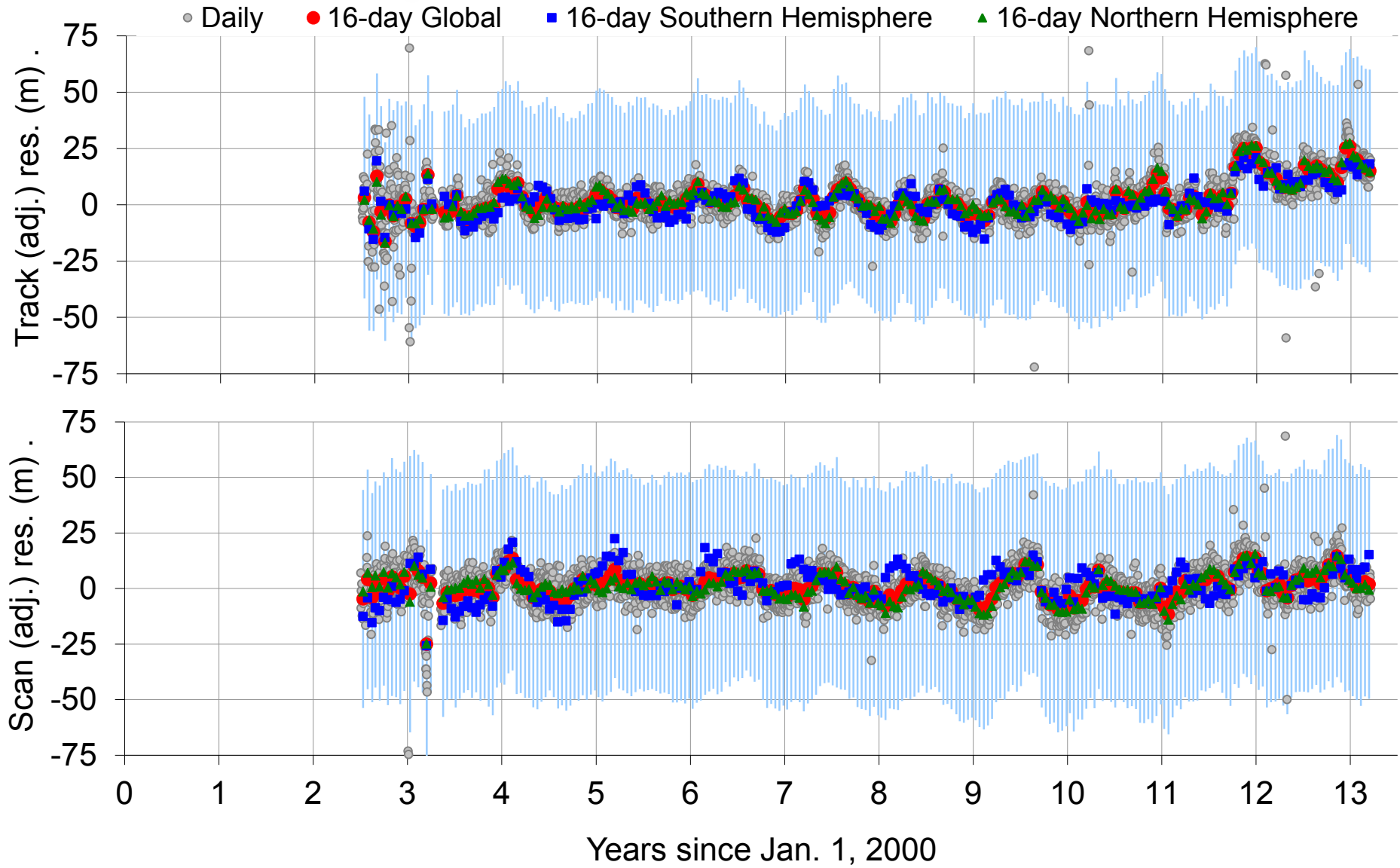# Terra Sun angle Correction

Used in C5

Used in C6

Track (from C4 fit)

$y = -0.0074x^2 + 1.2704x - 44.415$
$R^2 = 0.8514$

Track (from C5 fit)

$y = -0.0025x^2 + 0.5511x - 22.682$
$R^2 = 0.7863$

Scan (from C4 fit)

$y = -0.0068x^2 + 1.3044x - 49.118$
$R^2 = 0.8886$

Scan (from C5 fit)

$y = -0.0031x^2 + 0.7185x - 34.362$
$R^2 = 0.8647$

Shift (meters)

Sun angle (degrees)

Small overcorrection in C5 – was corrected in C6

Aqua trend and update details

Aqua Long-term Trend (w/o Correction)

Legend: Daily • 16-day Global ■ 16-day Southern Hemisphere ▲ 16-day Northern Hemisphere

Y-axis (top): Track (adj.) res. (m)
Y-axis (bottom): Scan (adj.) res. (m)
X-axis: Years since Jan. 1, 2000

RMSE with no correction: Track: 60 m (+15 m vs C6)   Scan: 56 m (+5 m vs C6)

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Actual Aqua C5 residuals
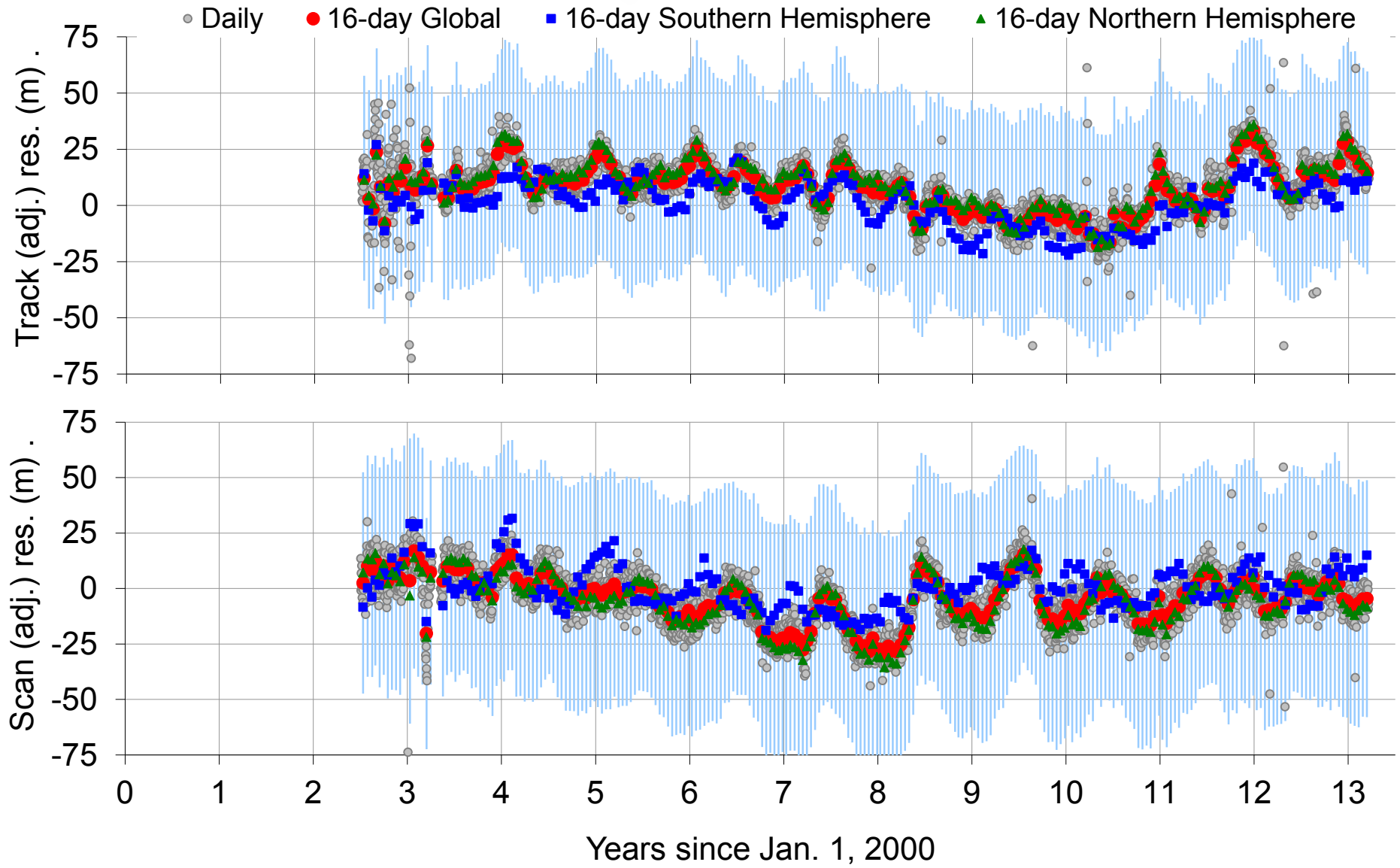
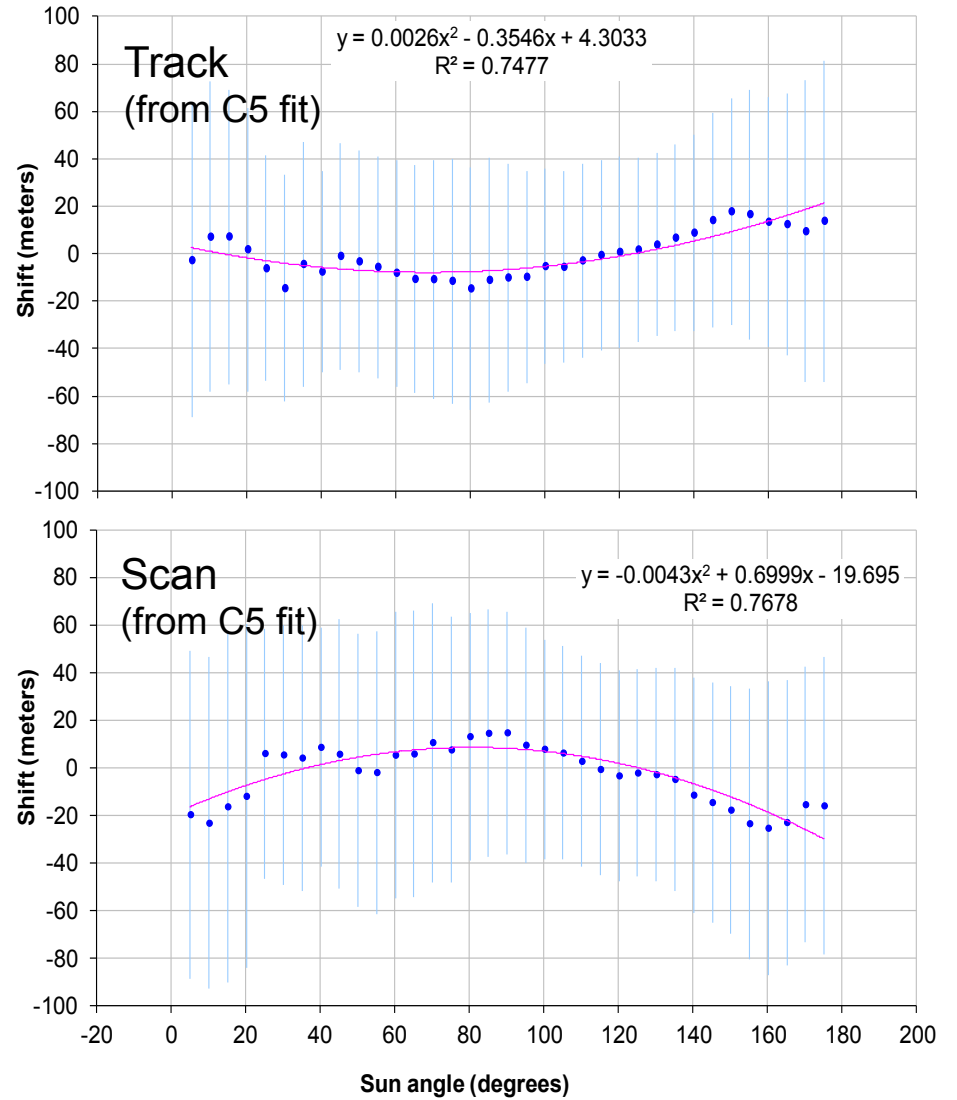C5 RMSE   Track: 48 m   Scan: 53 m

Aqua C6 residuals (estimated)

C6 RMSE   Track: 46 m (-2 m vs C5)   Scan: 51 m (-2 m vs C5)

Aqua Sun angle Correction

Track and Scan sun-angle effects
  - no correction in C5
  - used in C6

Track (from C5 fit)

$y = 0.0026x^2 - 0.3546x + 4.3033$
$R^2 = 0.7477$

Scan (from C5 fit)

$y = -0.0043x^2 + 0.6999x - 19.695$
$R^2 = 0.7678$

Shift (meters)

Sun angle (degrees)

C6 Changes – Algorithm (Science)

1. Update error analysis: use C5 residuals to update long-term trend, sun-angle corrections and geometric parameter biases

2. Incorporate new ancillary data

   a. Improved 500m Shuttle Radar Terrain Mission (SRTM) Digital Elevation Model data

   b. Improved Land/water mask (500m) developed by UMD

3. Compute 500m geolocation and provide in the form of 8-bit offsets from a bilinear-interpolation of the 1 km data

4. Enhanced 1 km terrain correction (area based)

   - synergistic with 500m geolocation, since weighted average of 500m pixel centers is used to approximate 1km time-integrated weighting function

C6 observation weighted terrain correction

Center of 1 km
observation (view-vector)

Observation
field of view

Terrain
surface

Observation weighed
geolocation (C6)

Pierce point
geolocation (C5)

Ellipsoid
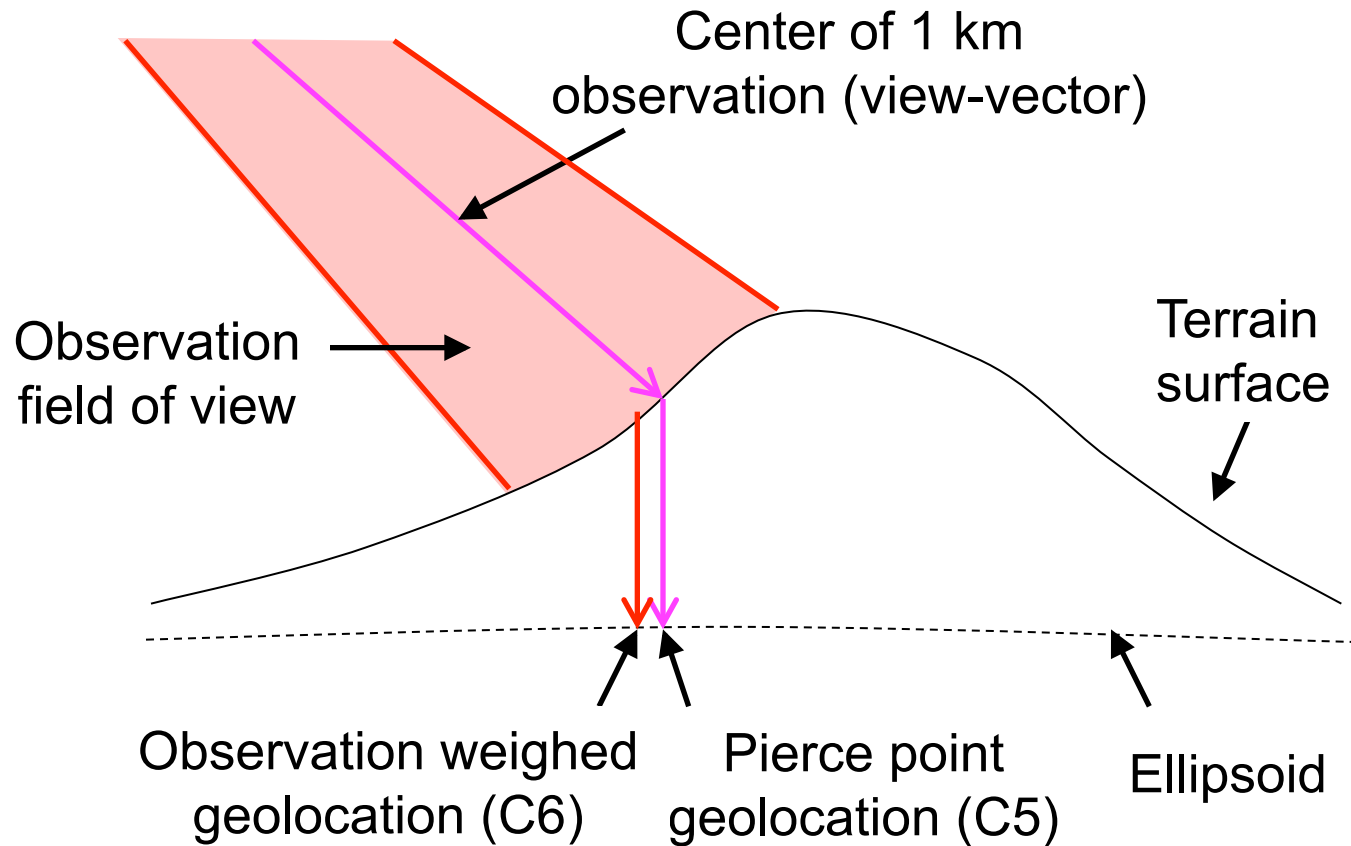
Old vs. New DEM

MODIS Geolocation Height (data-day 2010/221)
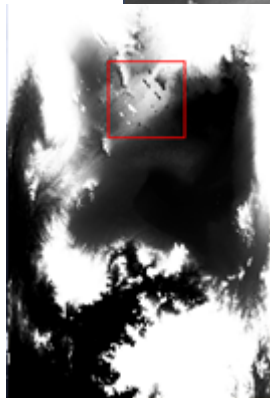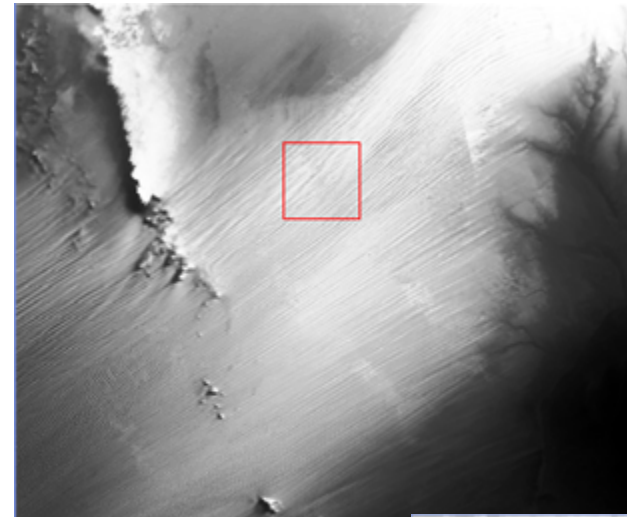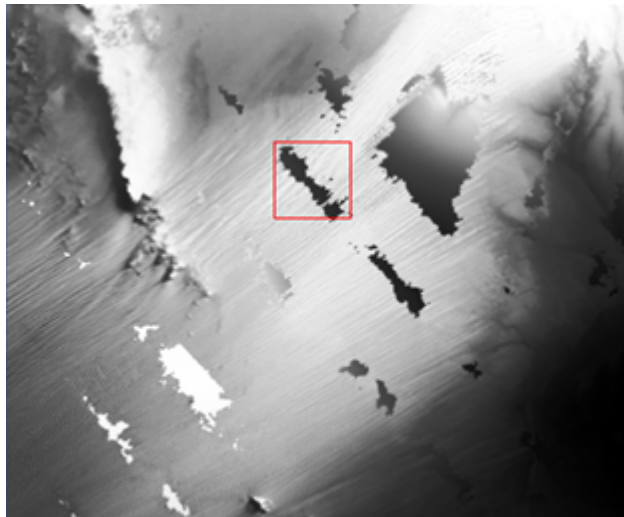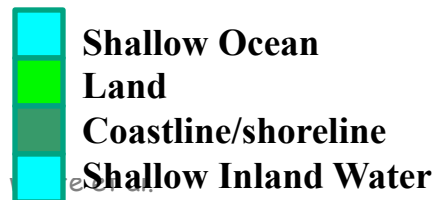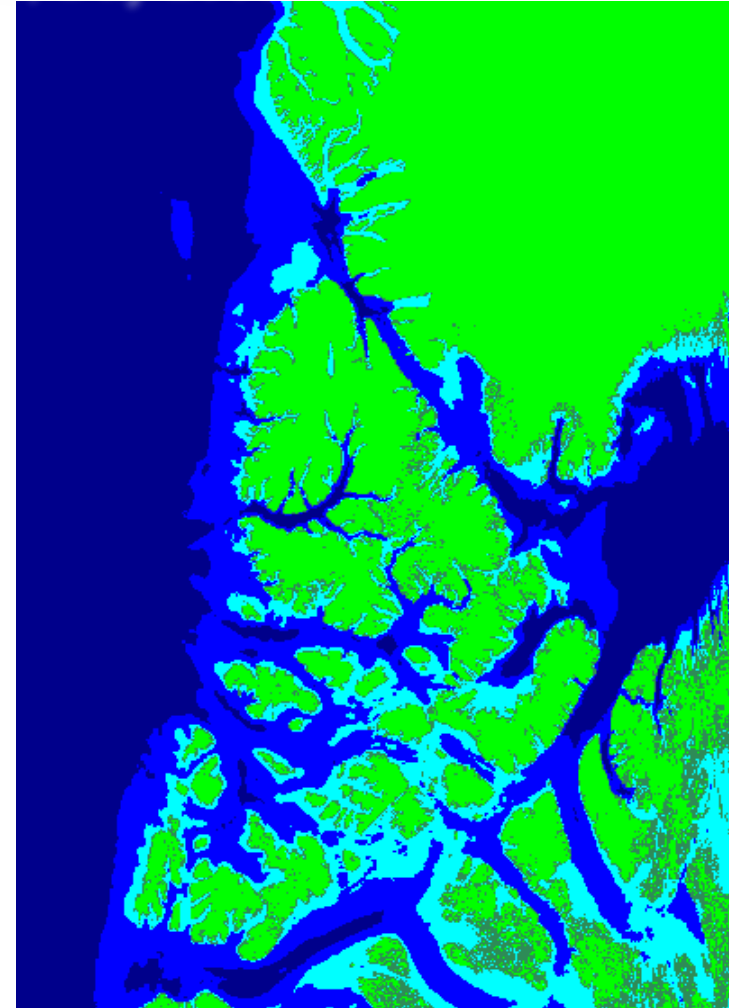

Current DEM
(C5)

New DEM
(C6)

New Land Water Mask in C6 MOD03
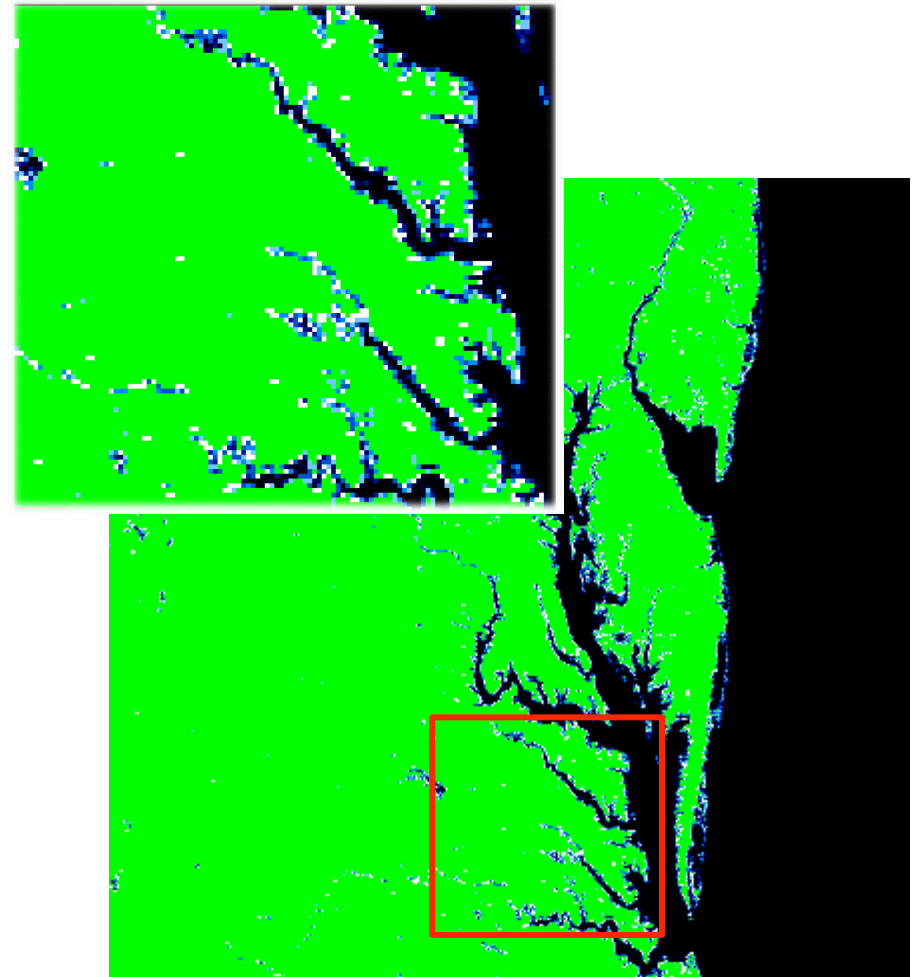
Terra Granule 19:25, Day 2003-193

C5

C6

Shallow Ocean
Land
Coastline/shoreline
Shallow Inland Water

Ephemeral Water
Deep Inland Water
Moderate Ocean
Deep Ocean
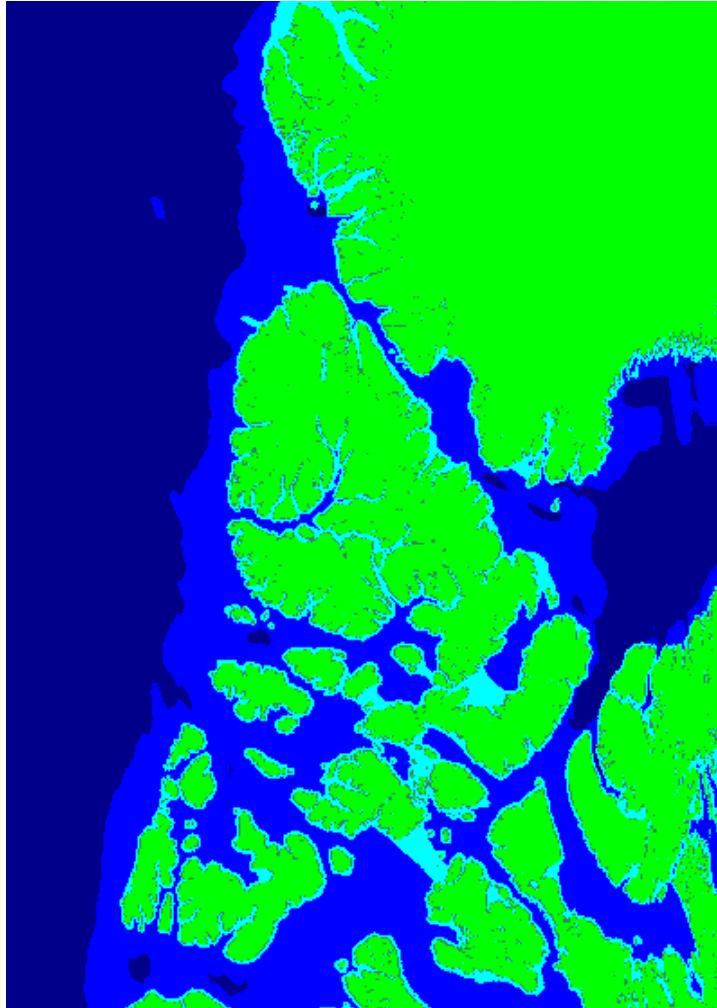
New Water Present in C6 MOD03

Land Water Mask

Water Present

Legend:
- Shallow Ocean
- Land
- Coastline/shoreline
- Shallow Inland Water
- Ephemeral Water
- Deep Inland Water
- Moderate Ocean
- Deep Ocean

1   8

Apr. 15, 2003 - Wolfe et al.

Terra granule subset 2003/193 16:20

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Questions?