Sea Level CCI project

PM6: Intercomparison of Arctic products

G.D. Quartly & A. Kurekin (PML)
Quick guide to the Arctic

Basic currents

N. Atlantic inflow near Norway + a little inflow via Bering Strait

Clockwise (anticyclonic) flow in Beaufort Gyre + Trans Polar drift towards Greenland

Main outflows on east and west of Greenland
Sea-ice coverage

NSIDC Maps

30-yr mean (1981-2010)

Max in March; Min in Sept.
CLS/PML product

Envisat


Provided at 2° res. for 50°-88°N (really 50°-82°N)

Over ocean
DTU product

ERS-1 / ERS-2 / Envisat / Cryosat-2


Provided at 0.5° res. for 66°-88°N

Over ocean + land
Mean of SSH

Height adjusted by 72-46.875 cm = 25.125 cm
Difference of 2 time series

DTU – C/P is ~3cm over open ocean
Over main ice region, bias ~ 7cm
Both show low variability for year-round open ocean, and also for W. of Greenland. Slightly greater variability in Beaufort Gyre region. Greatest in E. Siberian and Laptev Seas + Foxe Basin — *Which tide models were used?* BUT in ice-areas, DTU shows greater variability.
Month-to-month variation is much less in CLS/PML than in DTU
Both show large variations for E. Siberian, Laptev & Foxe Basin
Good agreement in Atlantic-Norwegian sector (esp. year round open ocean)  
CLS/PML shows very little seasonality in Chukchi, whereas DTU has a larger seasonal cycle there and over E. Siberian Sea — *Have both datasets been corrected for tides using same model?*
CLS/PML & DTU agree on Sept. peak for Atlantic & October for Atlantic - Norwegian Sea
They both show an early (Feb-Apr) peak in Baffin Bay (W. of Greenland)
For a large region DTU shows a coherent Feb. peak
Both show high variance explained for permanently open ocean
For CLS/PML, annual signal in Baffin Bay explains ~45% of variability;
for DTU annual signal is important in E. Siberian & Laptev Seas
CLS/PML & DTU show negative trends over majority of Arctic
Exceptions are E. Greenland Current and Beaufort Gyre
Other researchers have independently shown increase in Beaufort Gyre, but they do not have a negative trend elsewhere.
CLS/PML vs. DTU

Resolution
CLS/PML @ 2°; DTU @ 0.5°, but with a lot of smoothing
Weekly; Monthly

Extent
Up to 82° (Env.); Up to 88° (ERS-1/2 + Env + Cryosat-2)
Ocean + partially inland; Ocean + Land
Dec 02 – May 09; Sept 92 – Aug 14

Mean
CLS/PML has sharp spatial variations in mean; DTU appears very smoothed

Variability
CLS/PML shows less variability, especially in month-to-month changes

Annual Cycle
Ocean peaks in Sept. (both)
DTU has Feb. peak for large area, where CLS/PML has minimal signal
Explains ~50% of variance in Atlantic/Norwegian sector

Trend
Decrease for open ocean and Nordic Seas (both)
Increase for E. Greenland Current (both)
Increase for Beaufort Gyre (better representation in CLS/PML)