

# Satellite Global Ocean Surface Topography Measurements: Challenges and Opportunities

In Response to CGMS Action 40.01

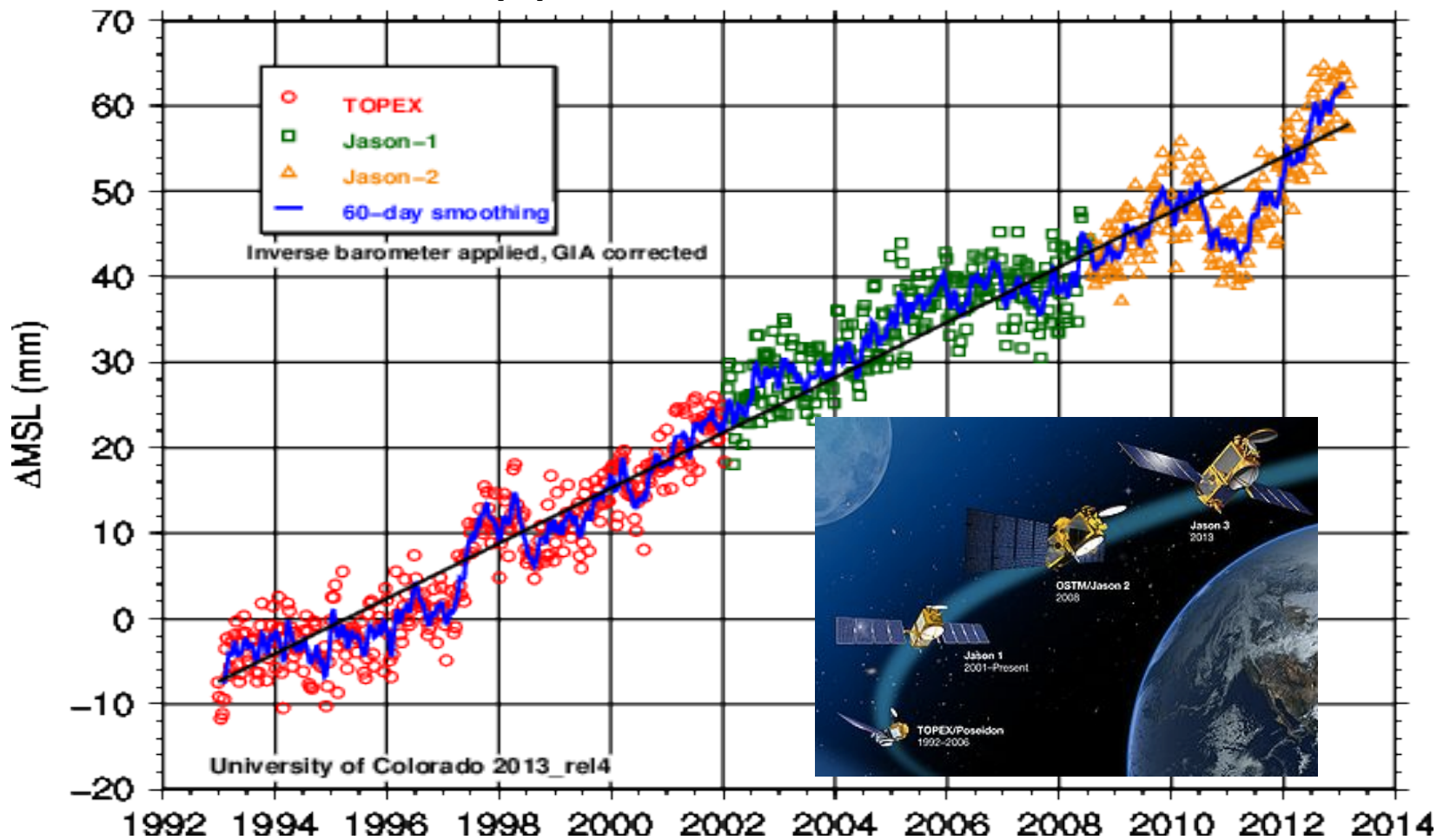
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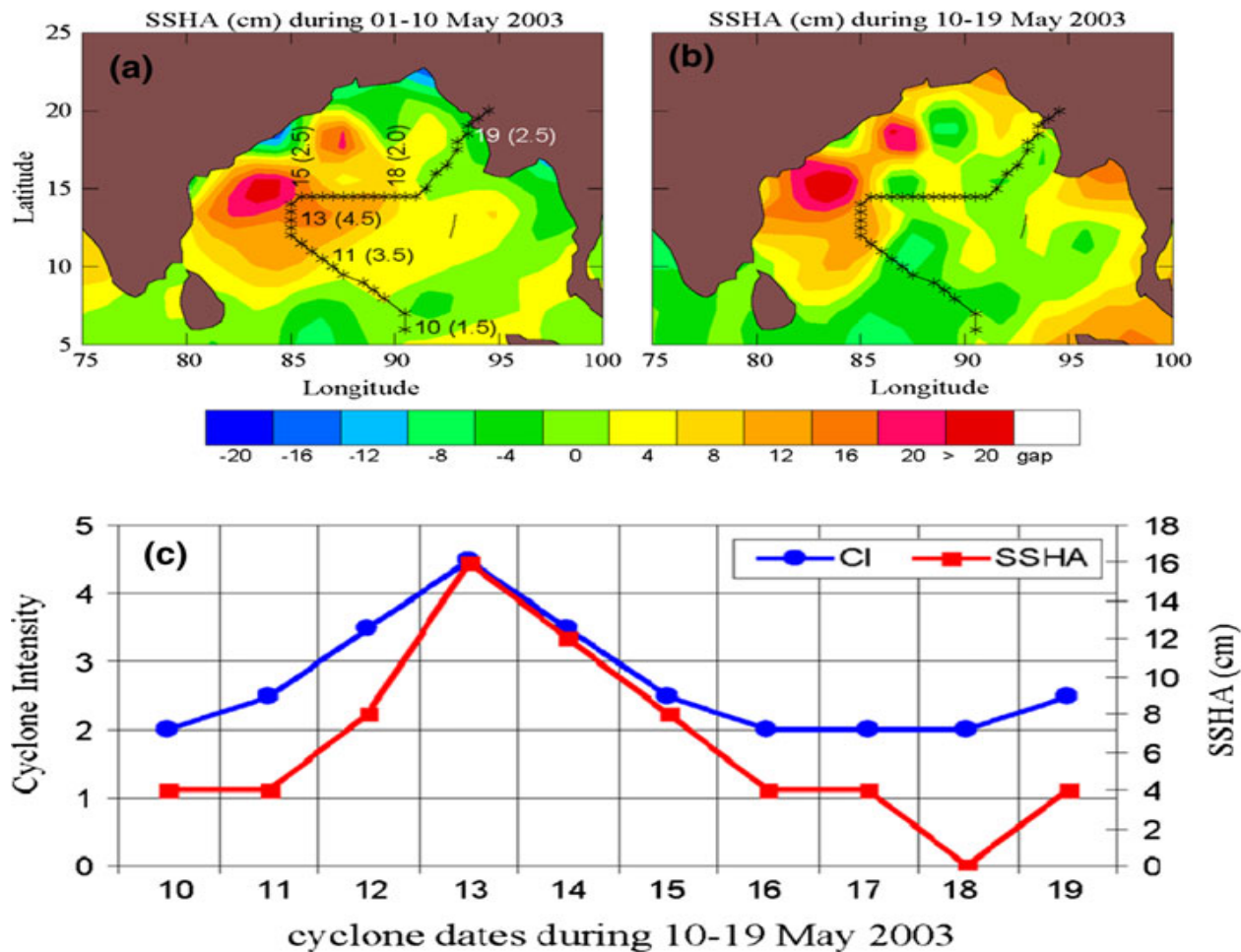
Recommendation/Action: (1) Support high-spatial resolution and high-temporal resolution ocean surface topography measurements for improved weather and climate applications. (2) Increase acquisition of all-weather or microwave measurements of sea surface temperature which, when combined with high-resolution ocean surface topography measurements, would improve forecast skill of tropical storm intensity.



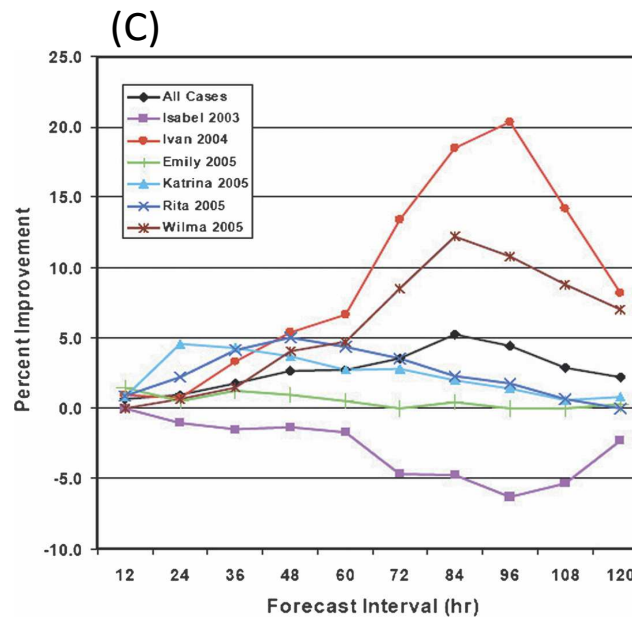
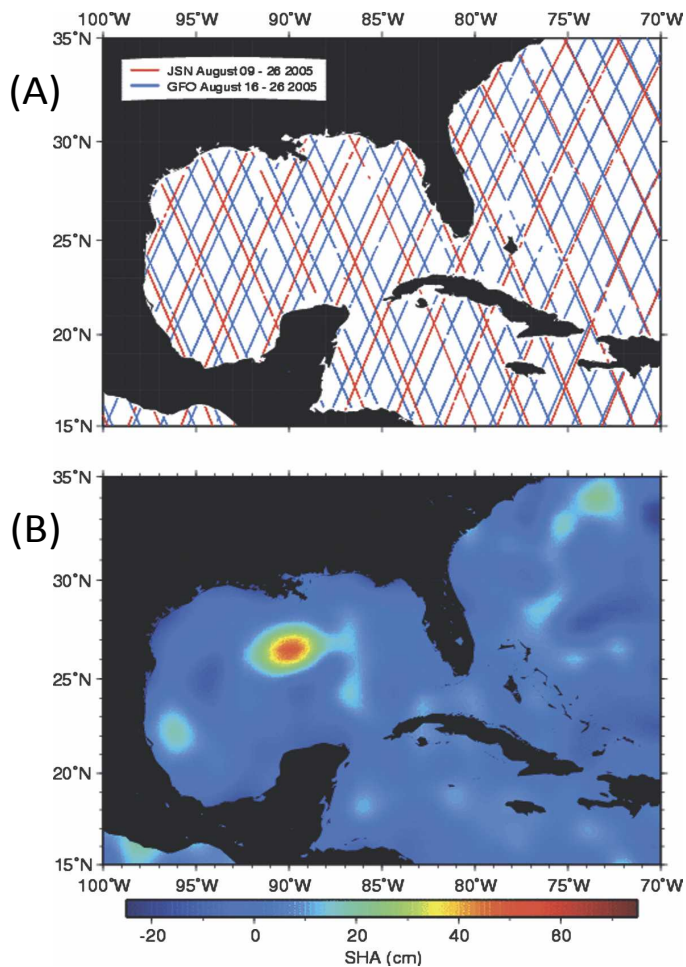
# Climate Application: Sea Level Rise



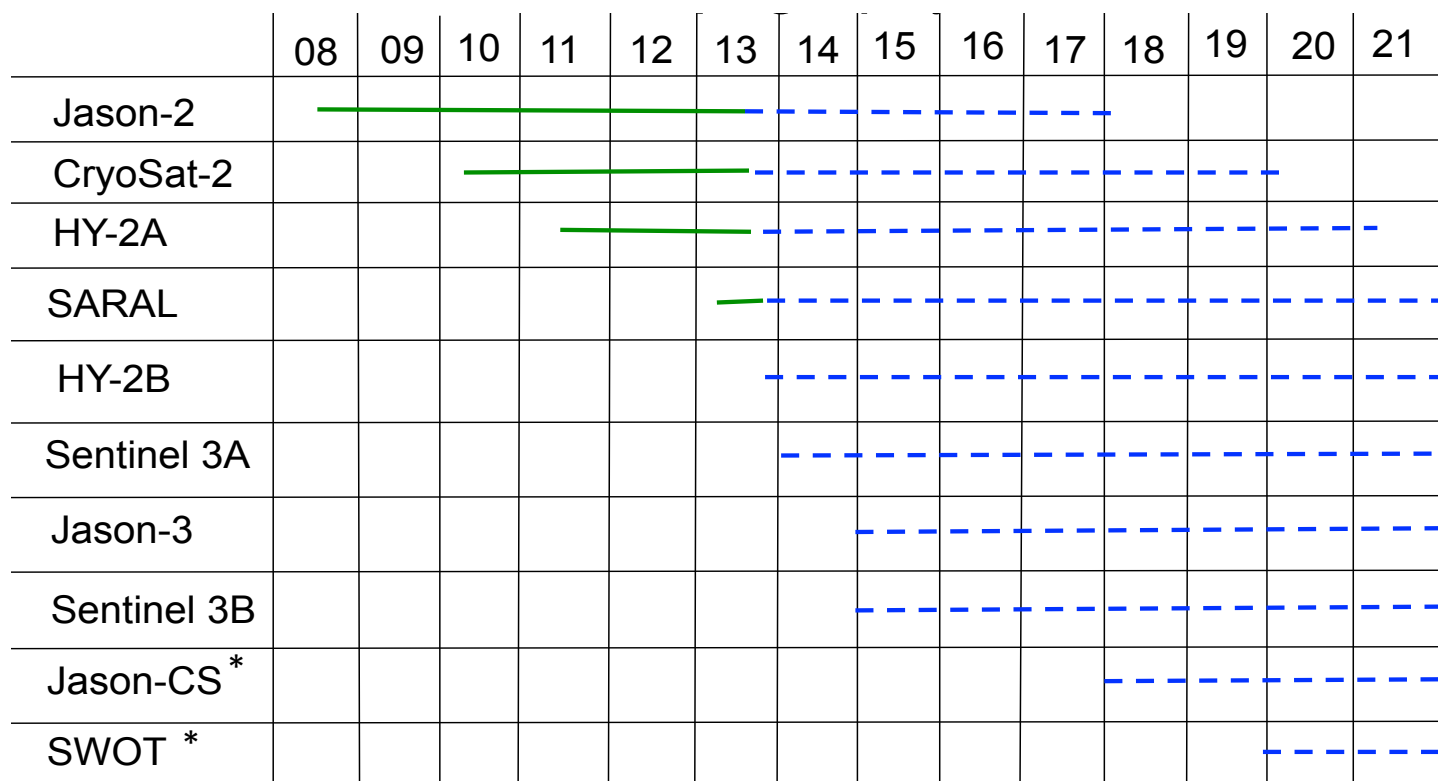
# Weather Application: Tropical Storm Forecast



# Weather Application: Tropical Storm Forecast



# On-orbit and Future Satellite Ocean Surface Topography Measurements

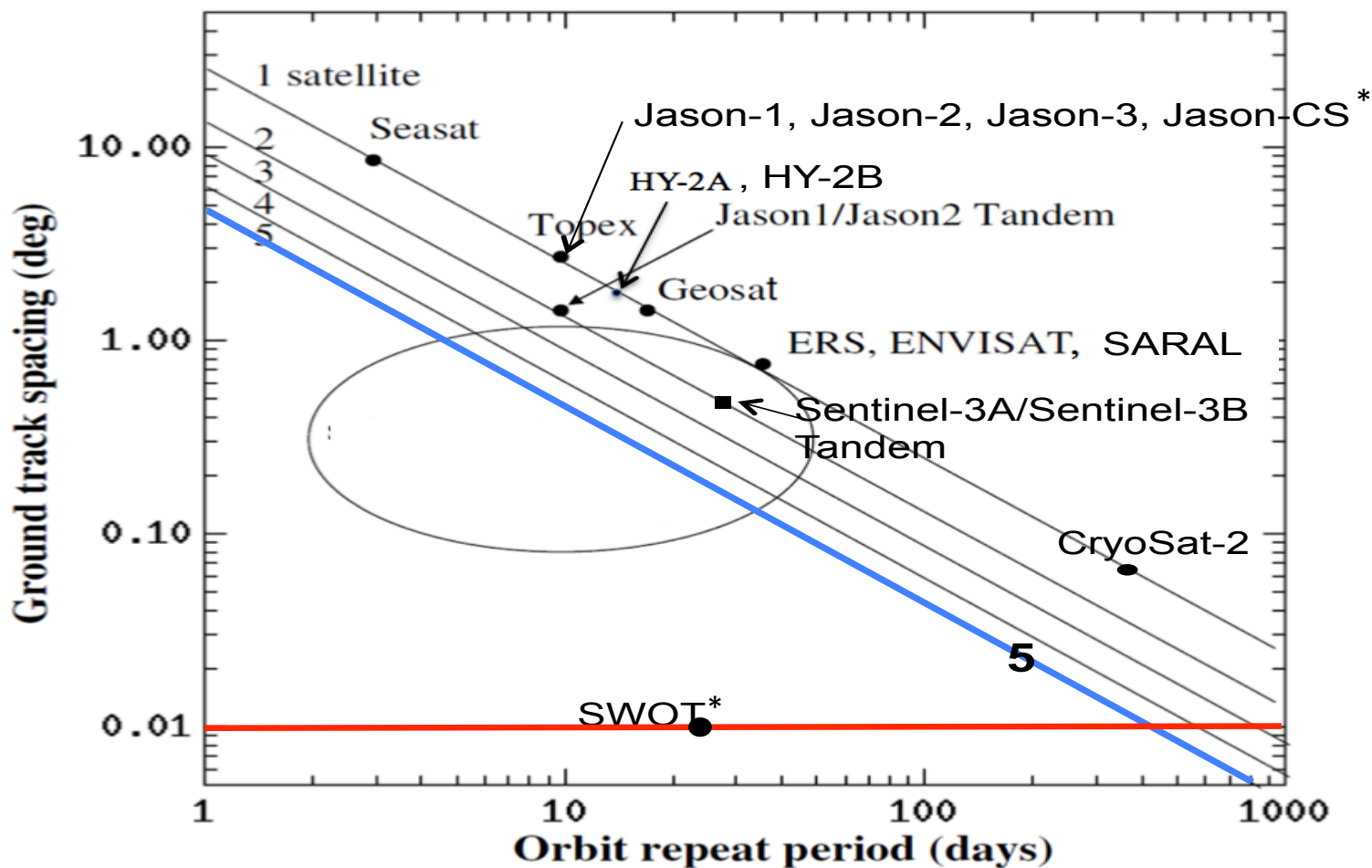


Data from [www.wmo-sat.info/oscar/satellites](http://www.wmo-sat.info/oscar/satellites)

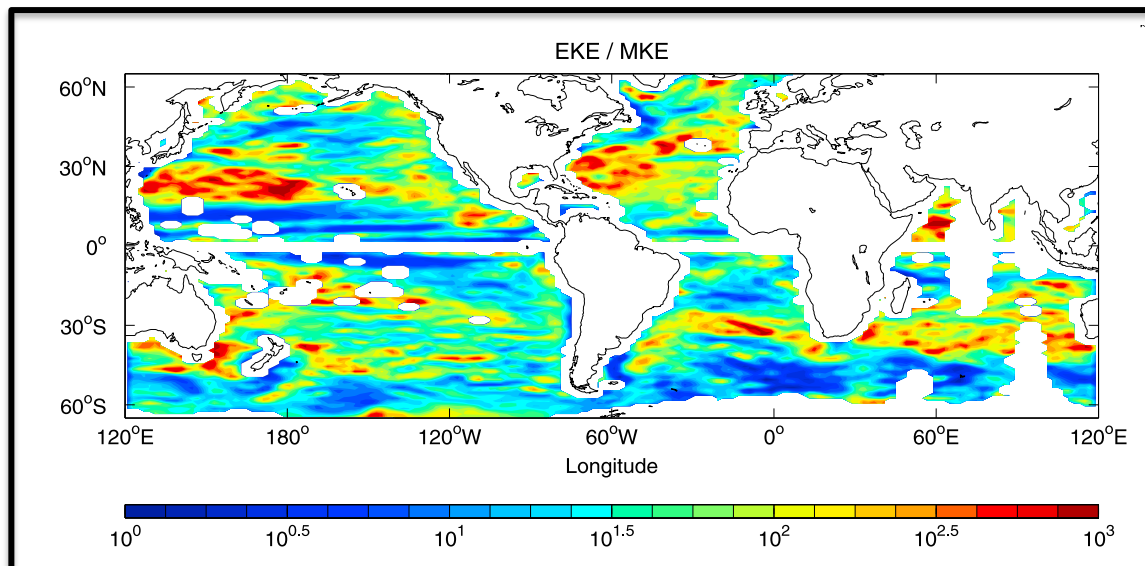
Dash line represents extension with arbitrary length based on ~ 10 year total operation.



# Satellite Conventional Altimeter Array

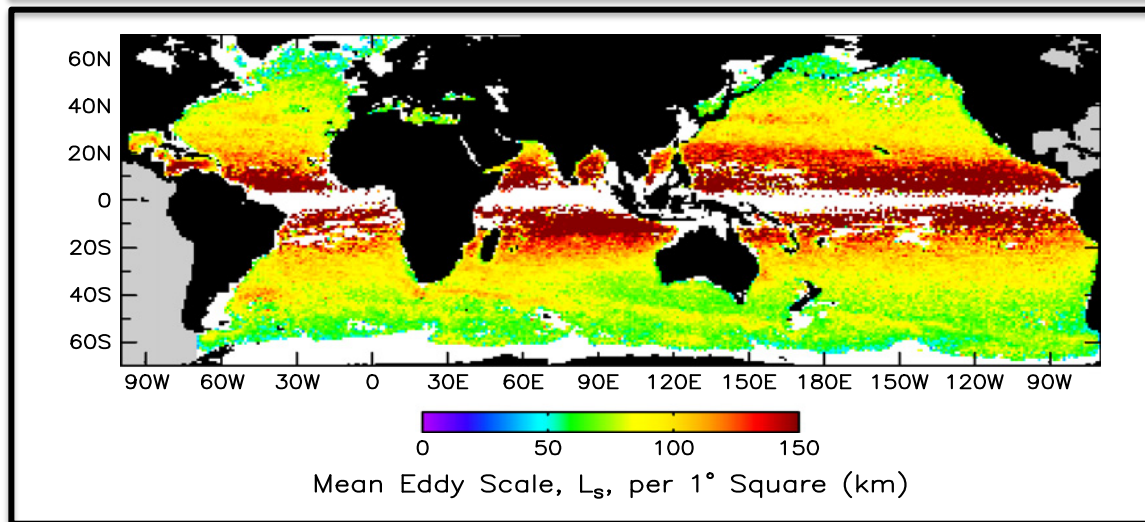


# Coordination Group for Meteorological Satellites - CGMS



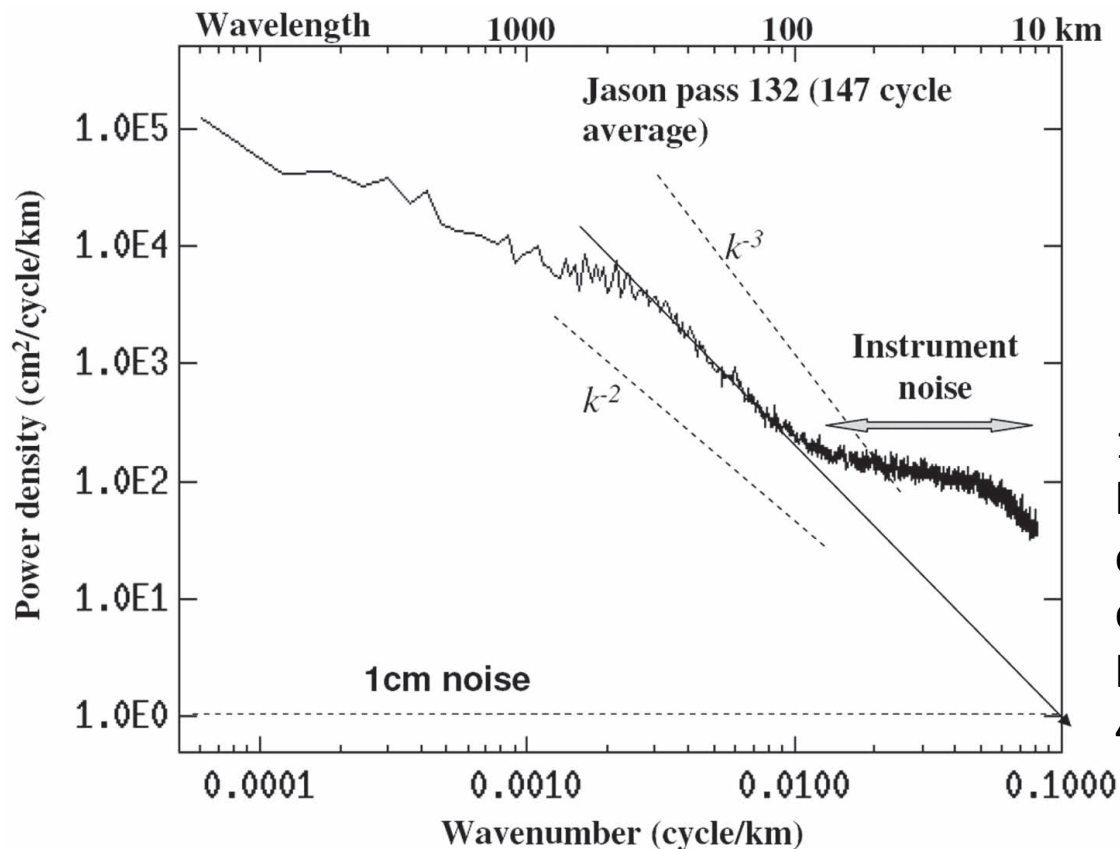
Sharffenberg and  
Stammer (2010)

## Eddy Motion



Chelton et al. (2011)

# SWOT\* Measurement Breakthrough: 1 cm<sup>2</sup>/cycle/km on 1-km x 1-km Grid

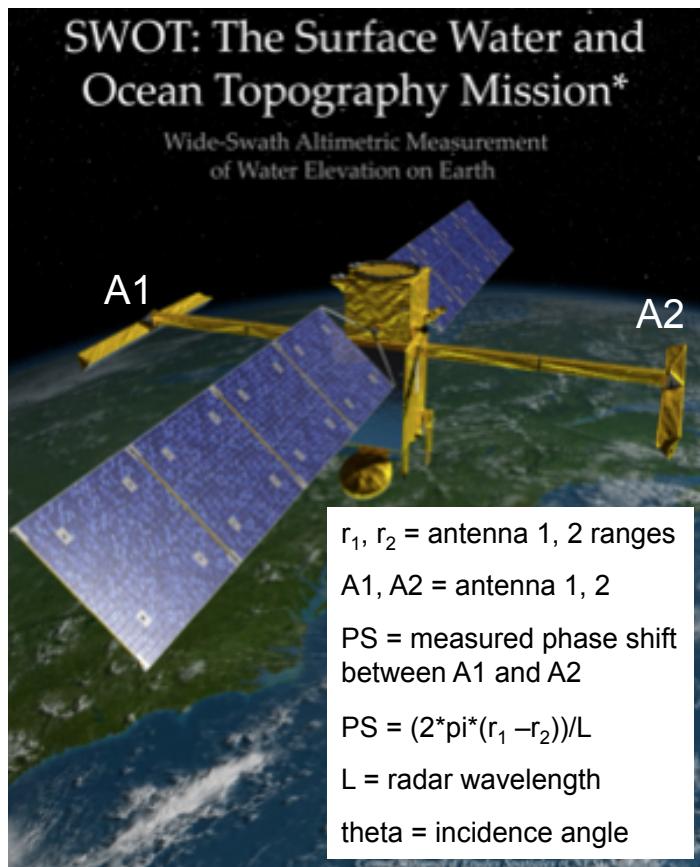


Fu and Ferrari (2008)

1 cm<sup>2</sup>/cycle/km noise level corresponds to 3 cm s<sup>-1</sup> geostrophic current error in a 10-km-diameter eddy at 45° latitude

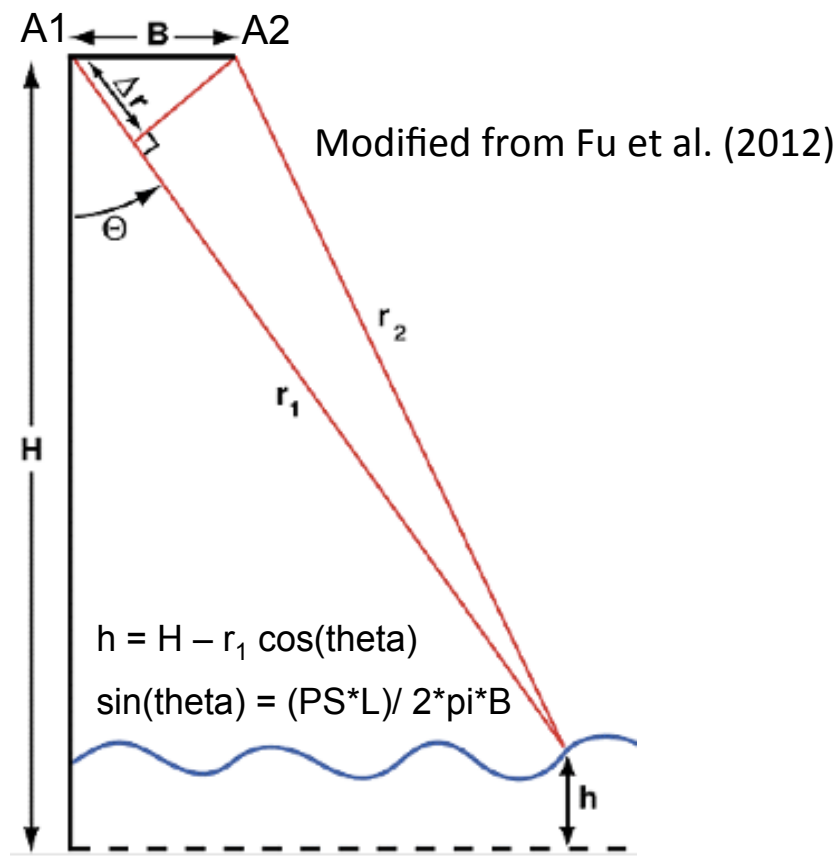


SWOT\* Along Track: 1 km x 1 km, continuous  
 SWOT\* Cross Track: 1 km x 1 km, 100 km



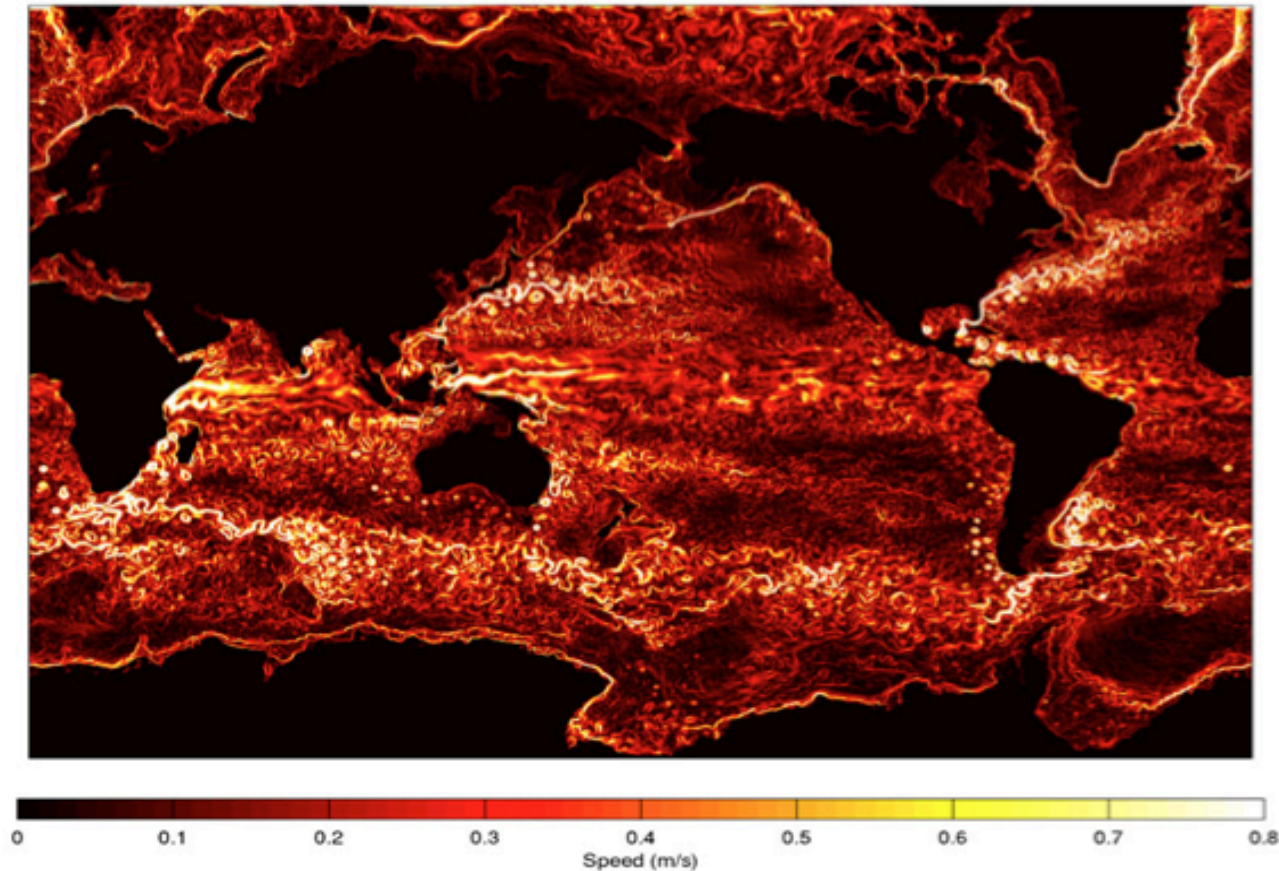
Artist's Concept

$r_1, r_2$  = antenna 1, 2 ranges  
 A1, A2 = antenna 1, 2  
 PS = measured phase shift between A1 and A2  
 $PS = (2 \cdot \pi \cdot (r_1 - r_2)) / L$   
 $L$  = radar wavelength  
 $\theta$  = incidence angle



# Ocean Current Speed ( $\text{m s}^{-1}$ )

ECCO2, 18 km x 18 km, 15 m, 6-h Average



תודה  
Dankie Gracias  
Спасибо شكراً  
Merci Takk  
Köszönjük Terima kasih  
Grazie Dziękujemy Děkojame  
Ďakujeme Vielen Dank Paldies  
Kiitos Täname teid 谢谢  
**Thank You** Tak  
感謝您 Obrigado Teşekkür Ederiz  
감사합니다  
Σας ευχαριστούμε  
Bedankt Děkujeme vám  
ありがとうございます  
Tack

