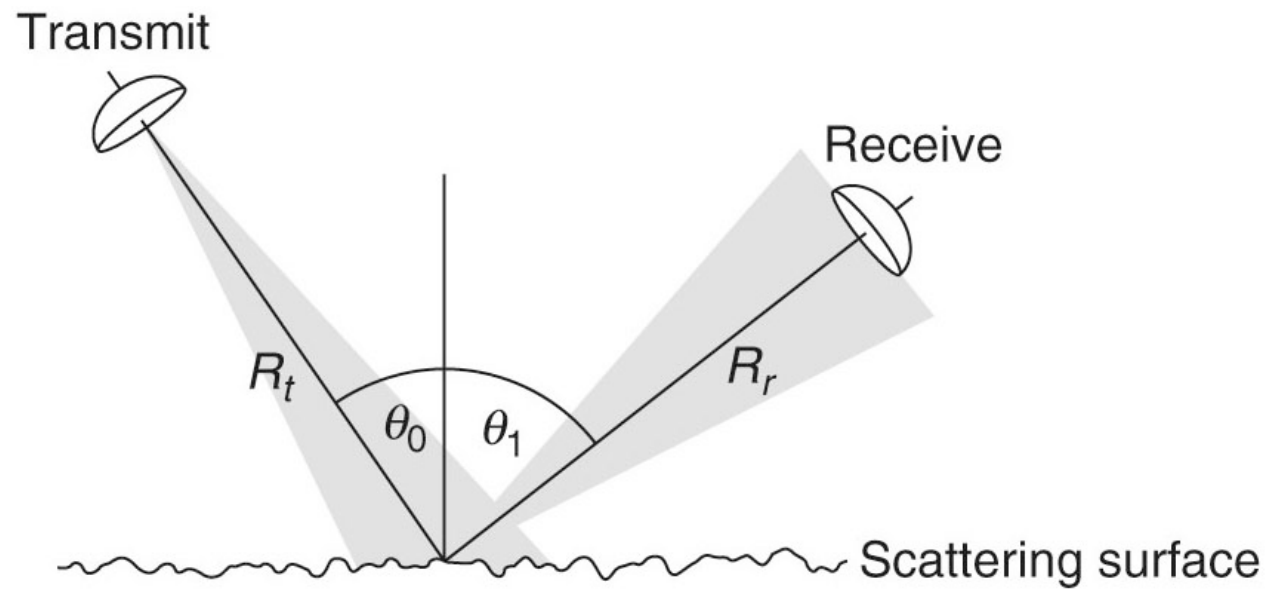


## Rees, 9.1 Radar Equation



Radar Equation on BB

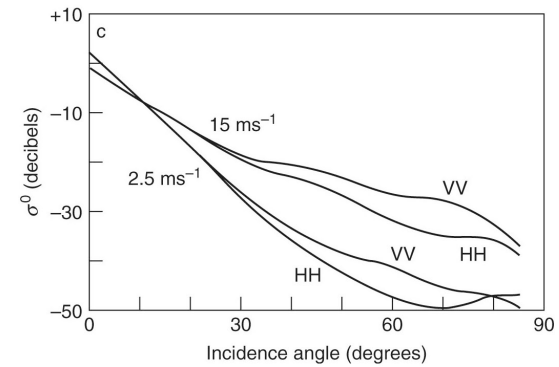
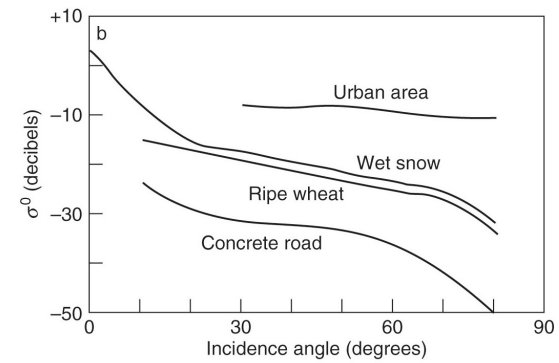
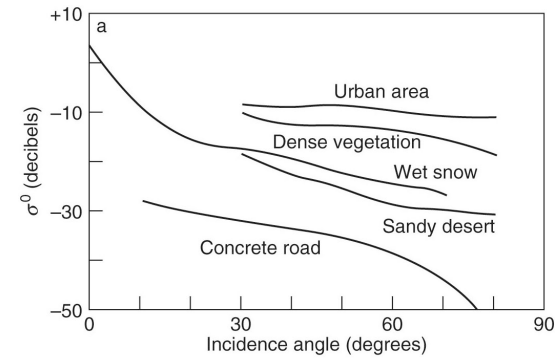
Backscatter cross section on BB

# Backscatter coefficient versus incidence angle

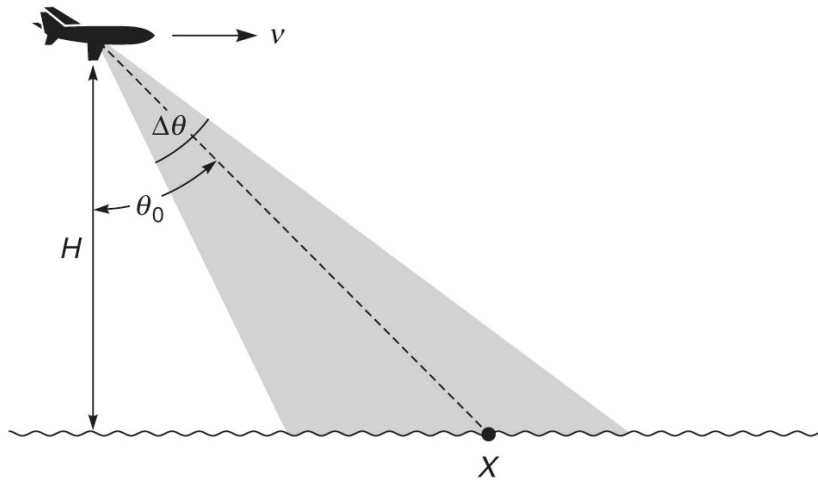
(a) HH

(b) VV

(c) ocean surface

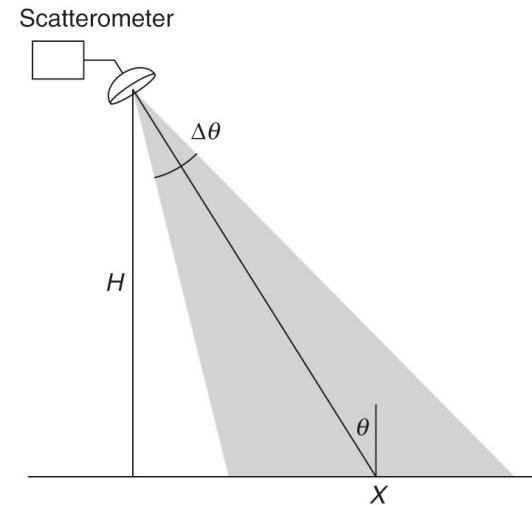


## Scatterometer can measure incidence angle



Doppler scatterometer

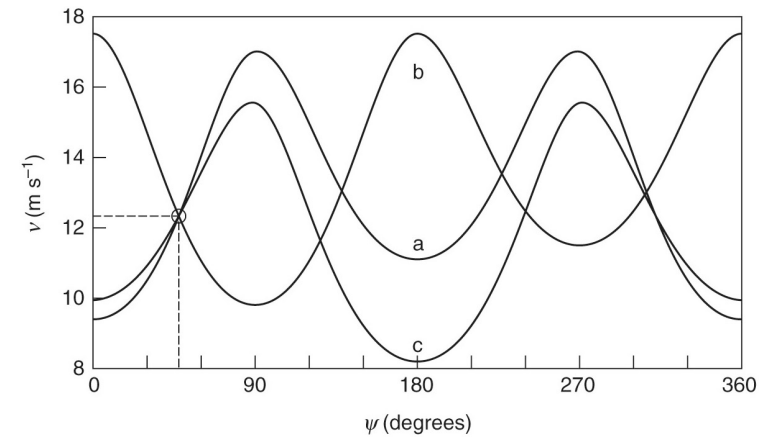
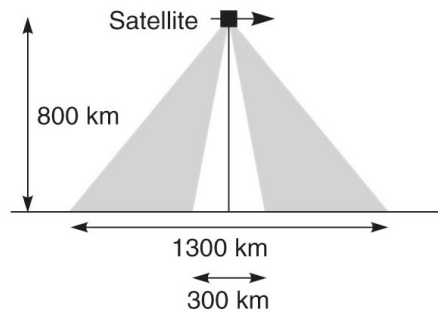
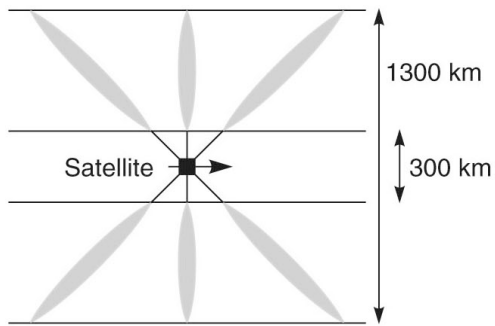
$$\delta f = \frac{2f_o V}{c} \sin \theta_o$$



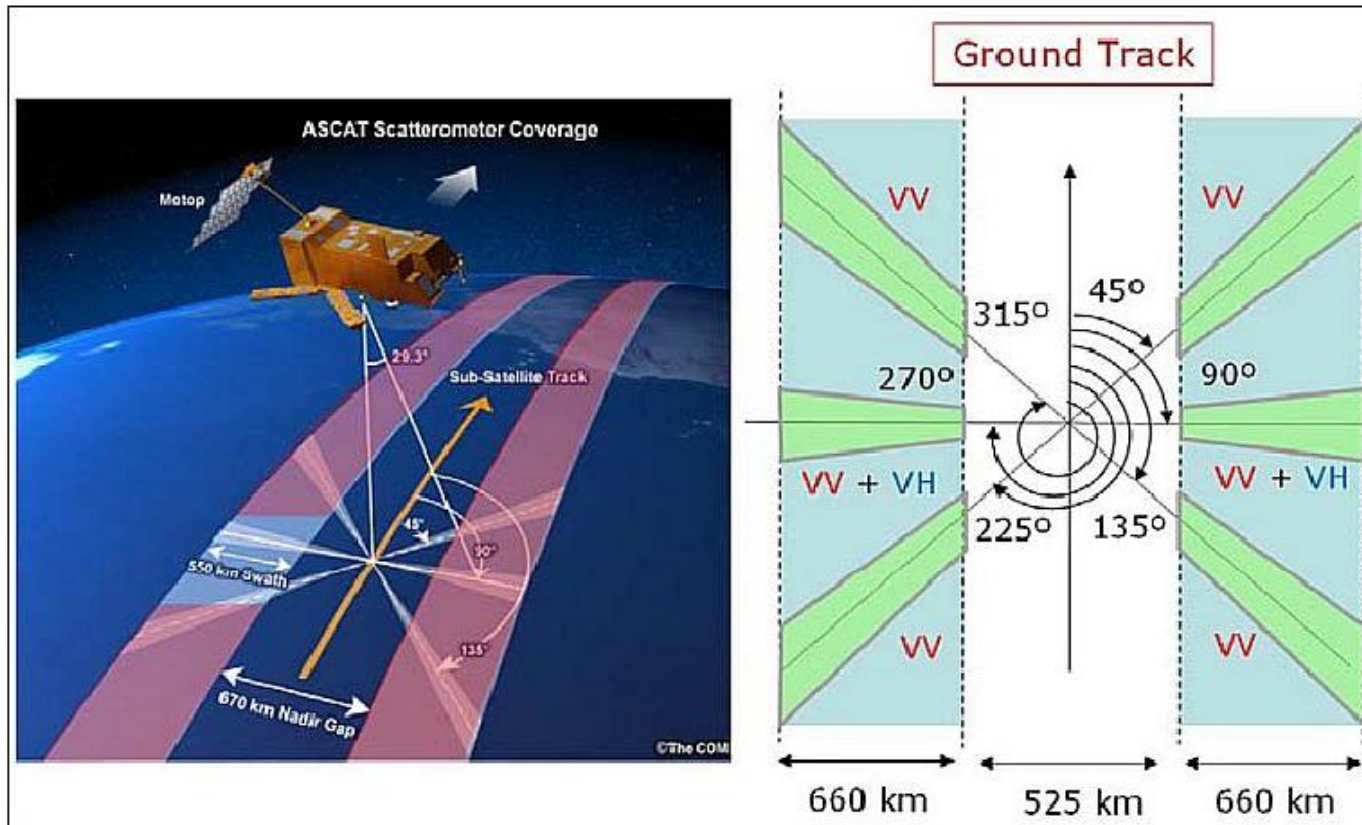
Time domain scatterometer

$$\Delta t = \frac{2H}{c \cos \theta_o}$$

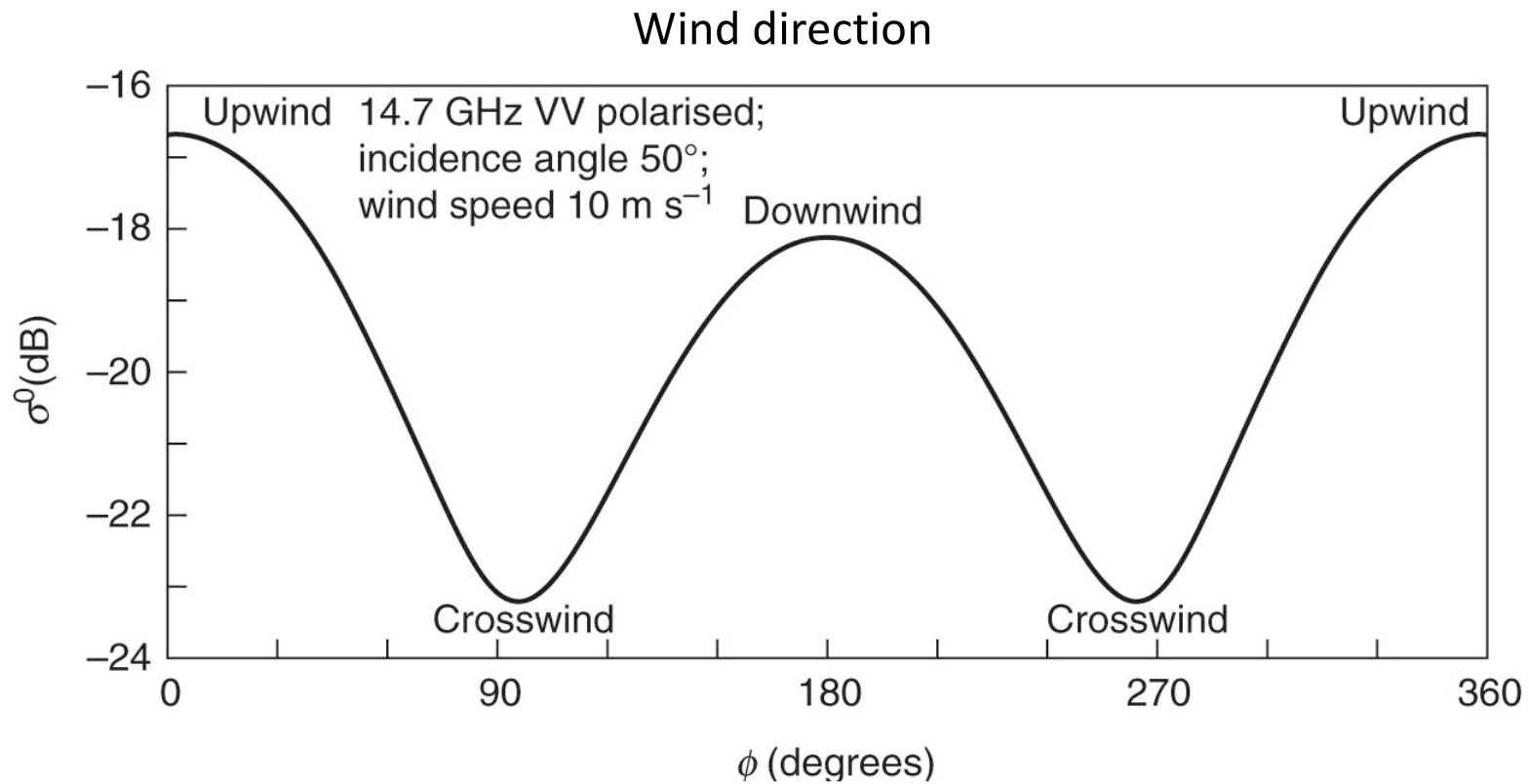
## Scatterometer can measure wind direction



# ASCAT schematic



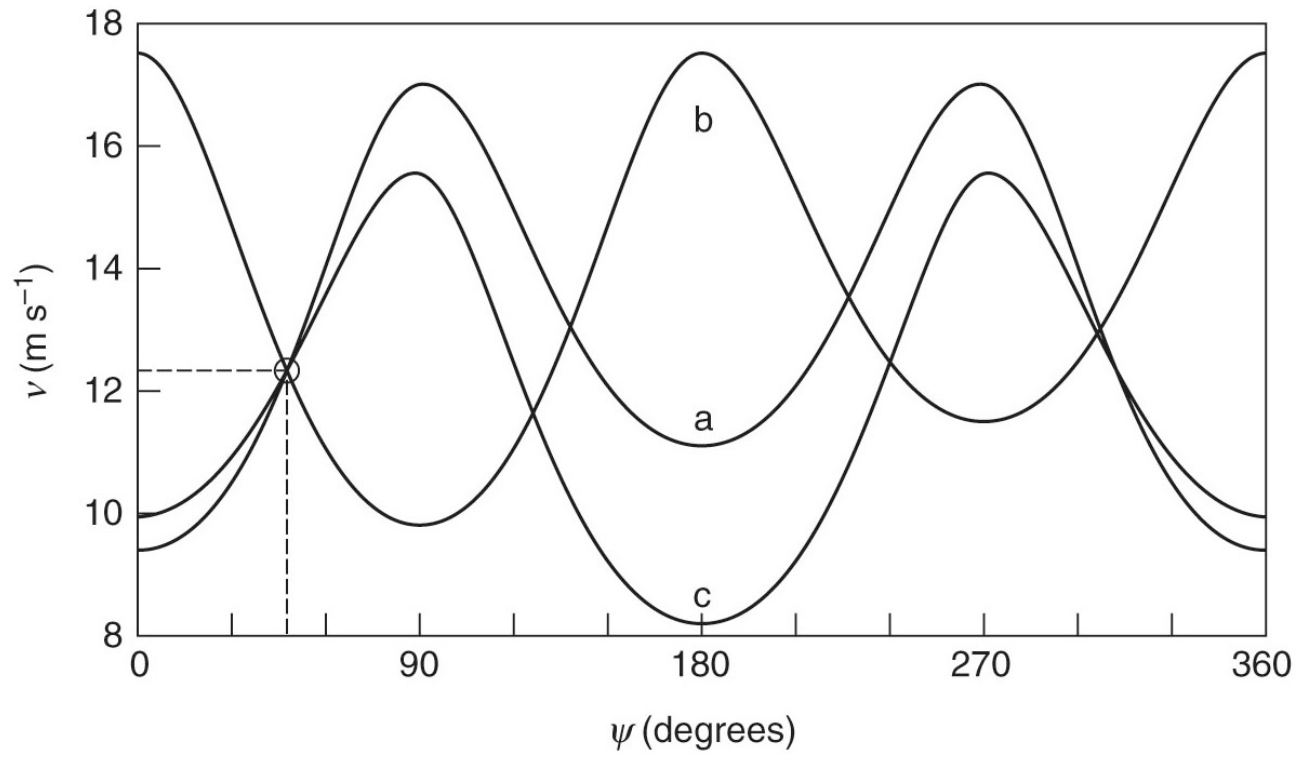
<https://directory.eoportal.org/web/eoportal/satellite-missions/m/metop-sg>



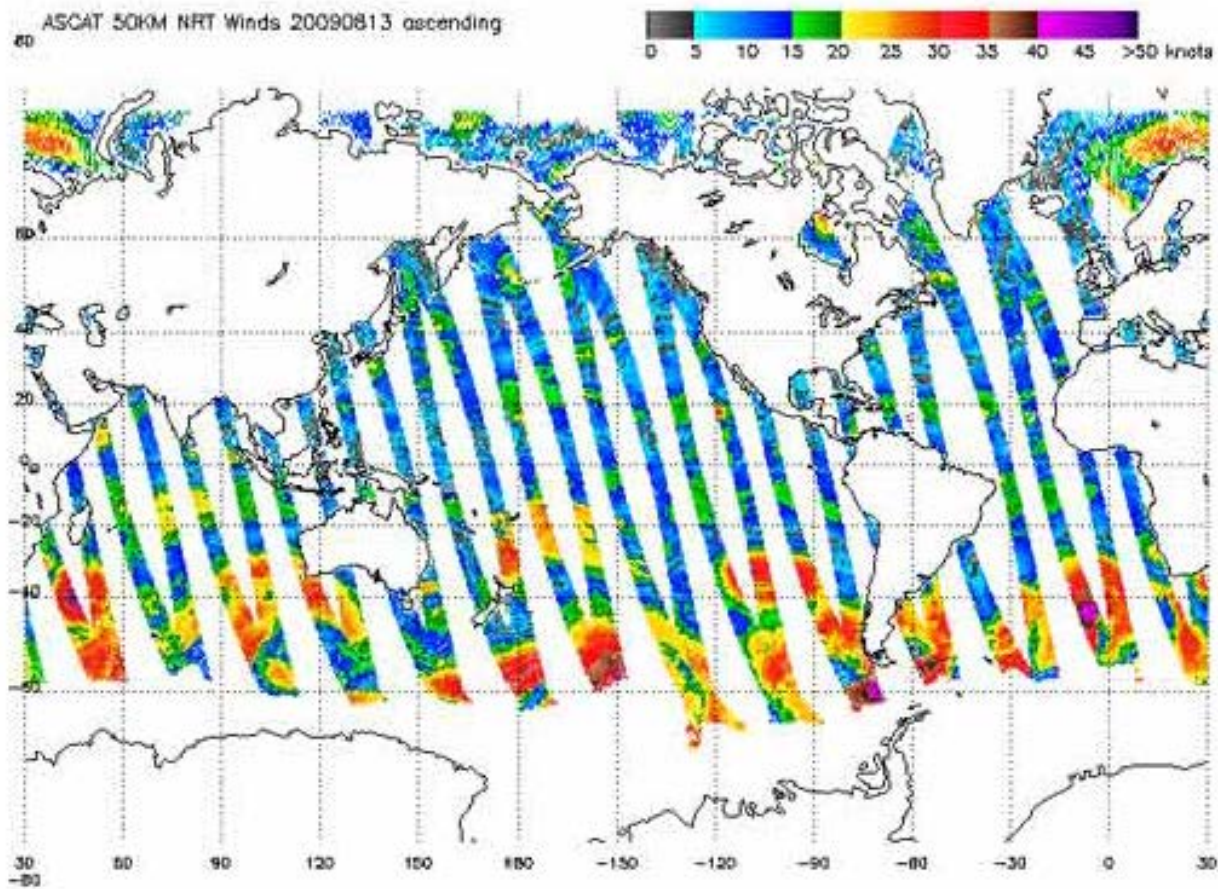
$$\sigma^o = A + B \cos \phi + C \cos 2\phi$$



# Wind direction

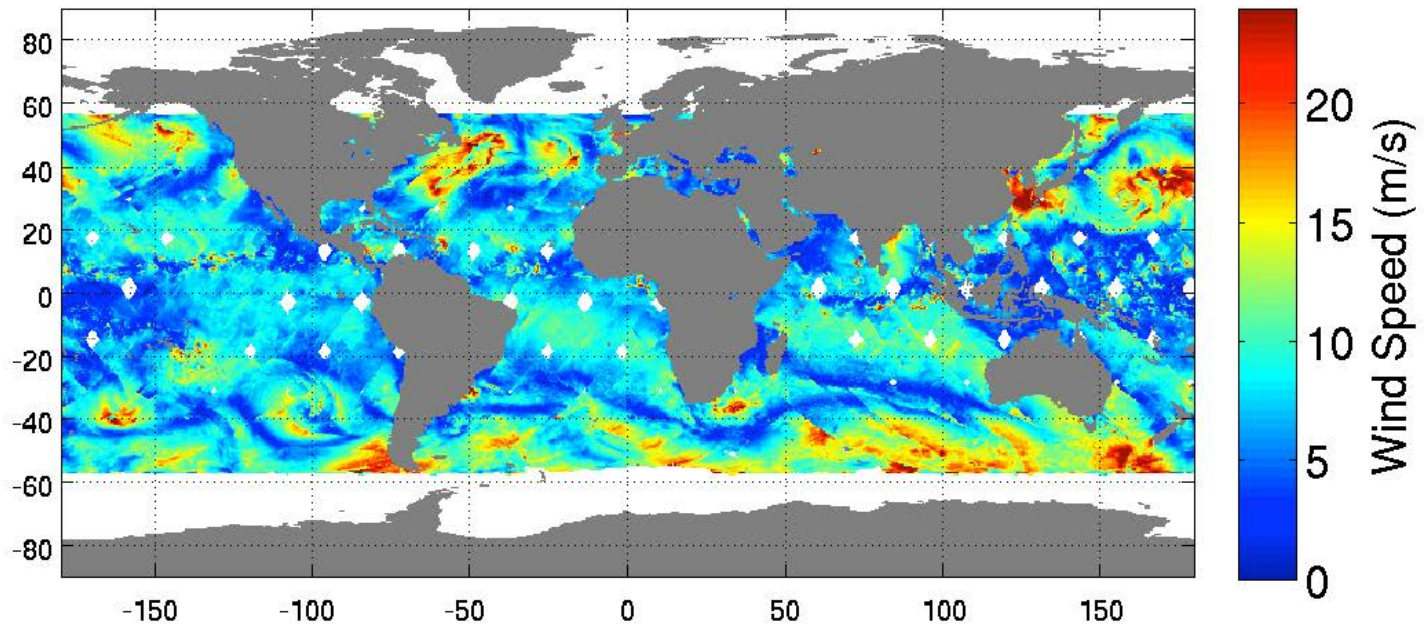


## Scatterometer Winds: ASCAT

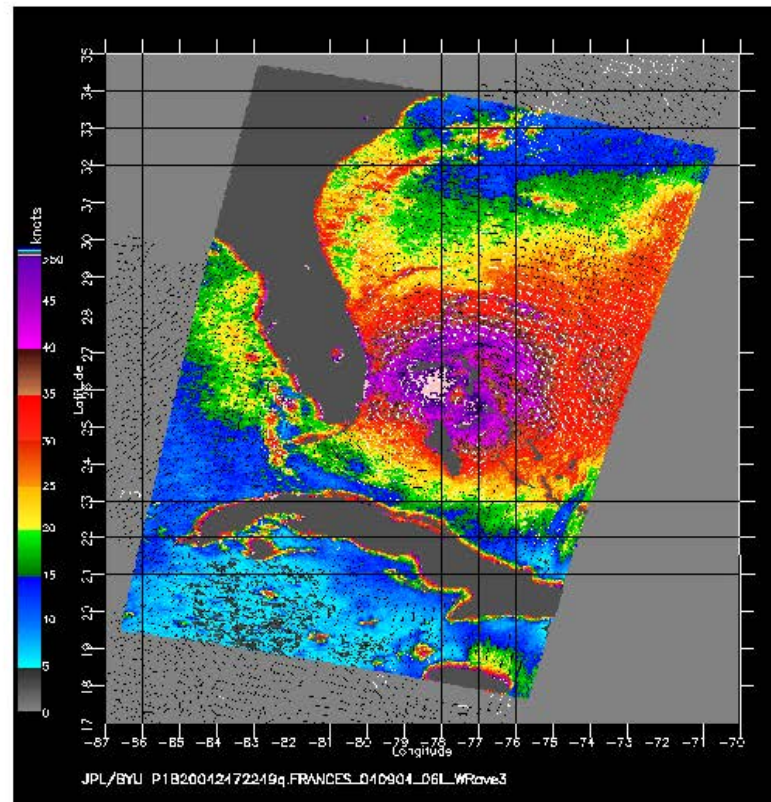


13 August 2009, NOAA/NESDIS, ASCAT winds

## *The view from RapidScat*

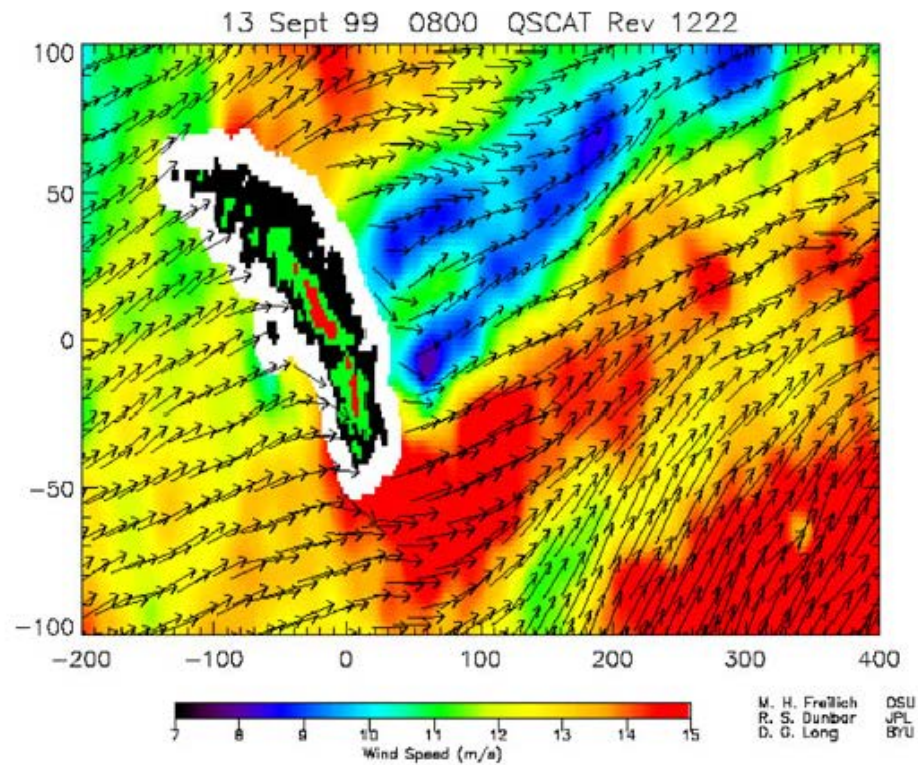


## QuikScat: Hurricane Frances



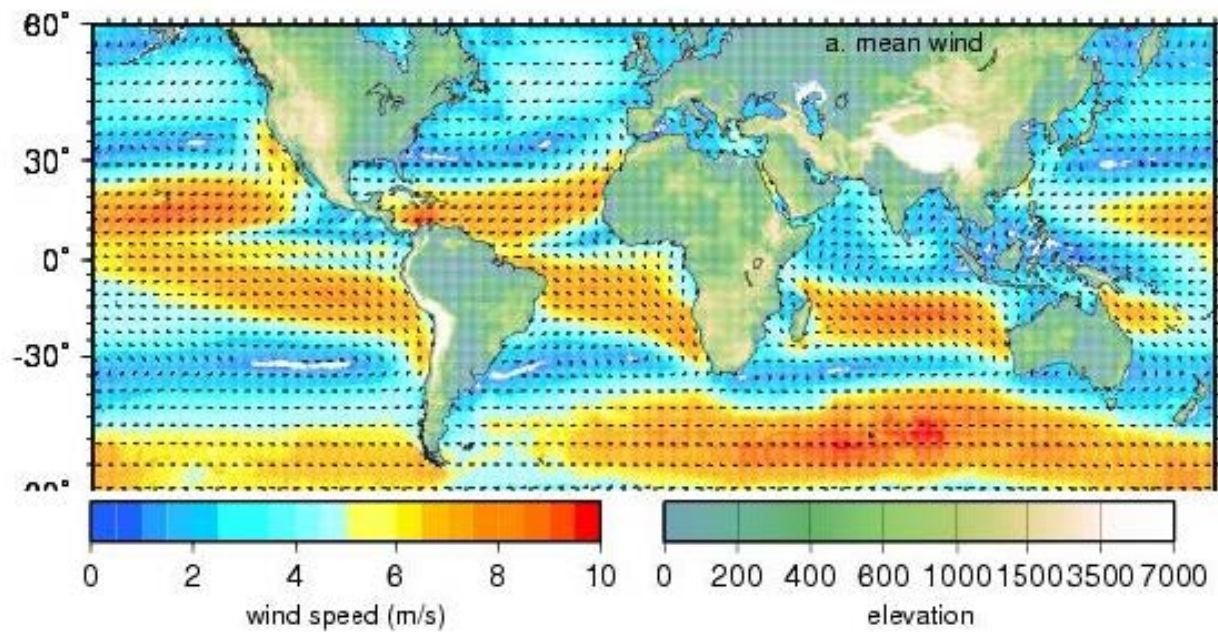
<http://winds.jpl.nasa.gov/imagesAnim/images.cfm?pageName=ImagesAnim&subPageName=Hurricane&>

## Wind Shadow for South Georgia Island



[http://winds.jpl.nasa.gov/publications/so\\_georgia\\_island\\_fig\\_2.cfm](http://winds.jpl.nasa.gov/publications/so_georgia_island_fig_2.cfm)

## Mean Winds from QuikScat



Real aperture radar on BB