

Maritime Wind Profiling

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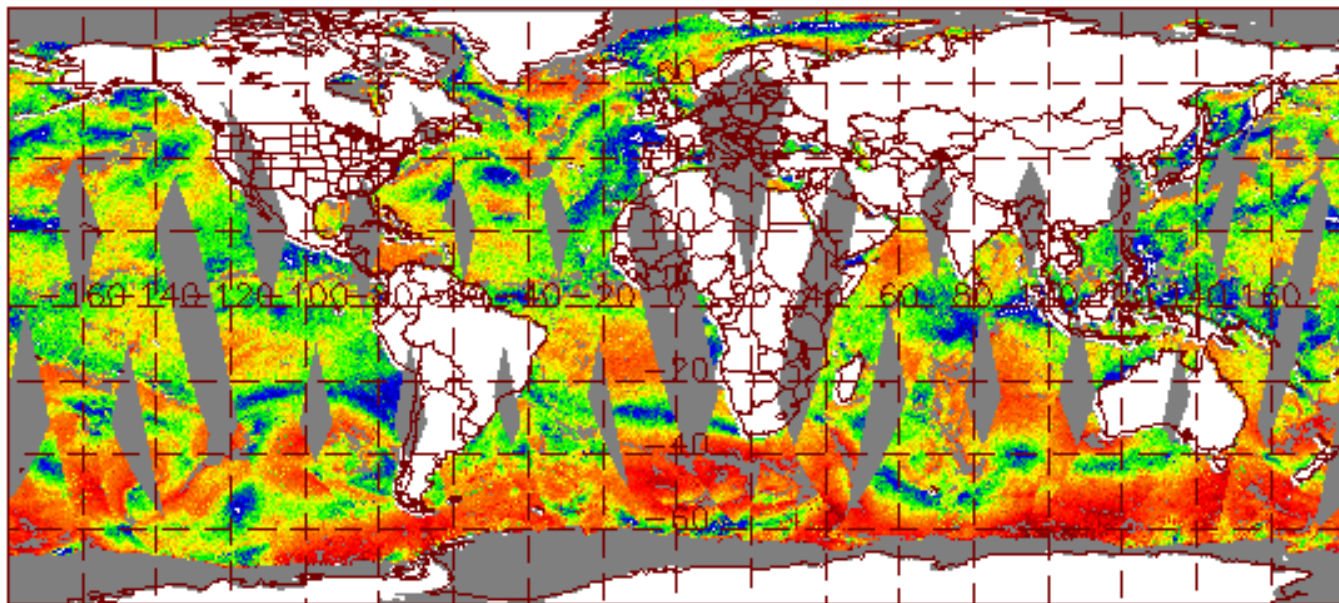


Global Winds from Satellites

- Global satellite wind observations well established
- Cloud top winds / above cloud winds
 - Passive optical methods (image processing)
 - Active optical methods (Doppler Lidar)
- Sea surface winds
 - Passive optical / microwave scattering
 - Active radar / opportunistic GNSS scattering

Global Winds from Satellites

SSM/I Wind Speed, m/s 6/21/2017 20 UTC



Satellite Wind Restrictions

- No clouds → no cloud top winds
- No sea surface winds from optical methods in cloudy areas
- In best case two to four observations throughout atmosphere
 - No profile observations
 - Low re-visiting rate
- No surface winds over land

Radar Wind Profiler

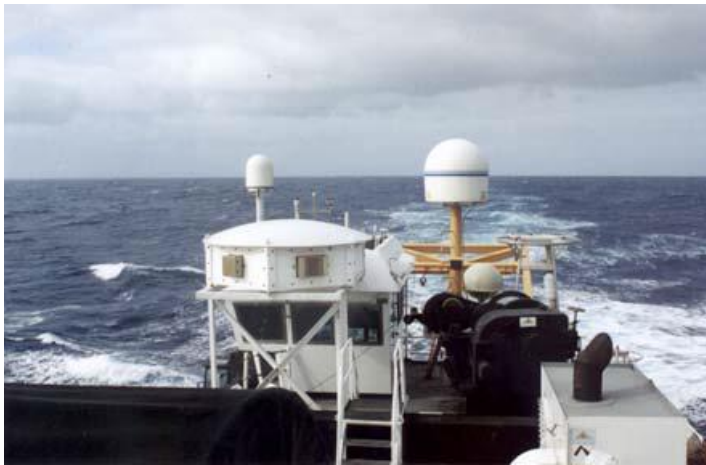
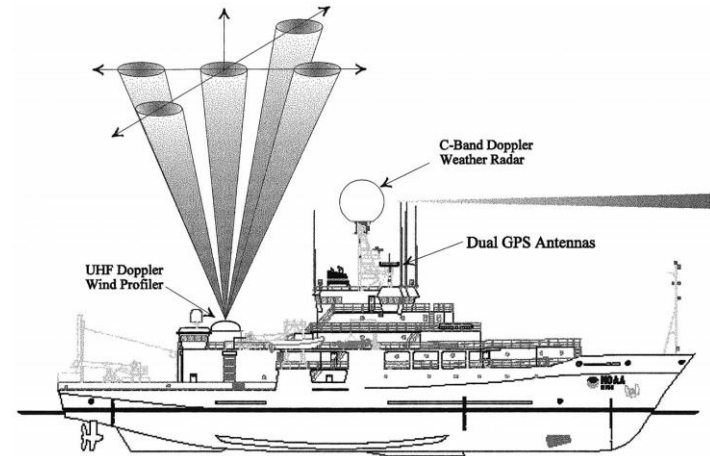
- Provides profiles of wind observations
 - Boundary layer RWPs with high range resolution and restricted range
 - Larger RWPs up to Tropopause with lower range resolution
 - (M)ST profilers reaching much higher altitudes
- Well established systems for use on land
- Not operationally used at sea

Other Wind Profiling Methods

- Multiple other operational wind profiling methods available over land
 - Radiosondes
 - Doppler Wind Lidar
 - Aircraft ascends into (major) airports
- Not operationally available at sea
 - Aircraft only en-route observations
- Radiosondes and RWP used at sea for research campaigns

Radar Wind Profiler at Sea

- RWPs operated at sea
- Example right: NOAA RV Ron Brown (USA)
 - Law et al, JAOT 19, 2002
- Requires some space



- Elaborative stabilisation system required
- See image left
 - Wolfe et al, AMS SMOI12
- Applies traditional method

Goal: Operational RWP at Sea

- Long-term or permanent operation at Sea
- Remove need for stabilisation
 - Small platform possible
 - Lower power consumption
- Use natural motion as advantage
- Develop novel retrieval methods
 - Based on cost function minimisation / LMS fit
- Core consortium in place

Development Activities

- State-of-the-art minimalist RWP
- Appropriate platforms
 - Easily rocking at small waves / low winds
 - Stable at high waves / high winds
 - Optional: Controlled mobility (e.g. AutoNaut)
- Adopted data acquisition system
- Novel retrieval method



Relevant Satellite Products

- Geolocation
 - Observations useless if location unknown
 - Satellite based geolocation well established
- Satellite Communications (SatComs)
 - Remote access (RWP Command & Control)
 - Transmission of observation data
- Data fusion with satellite winds
 - Combines global coverage with detailed view



Thank you for your attention!

I would be happy to answer your questions!