Spatial Patterns in Vertical Velocities Along the Florida Keys

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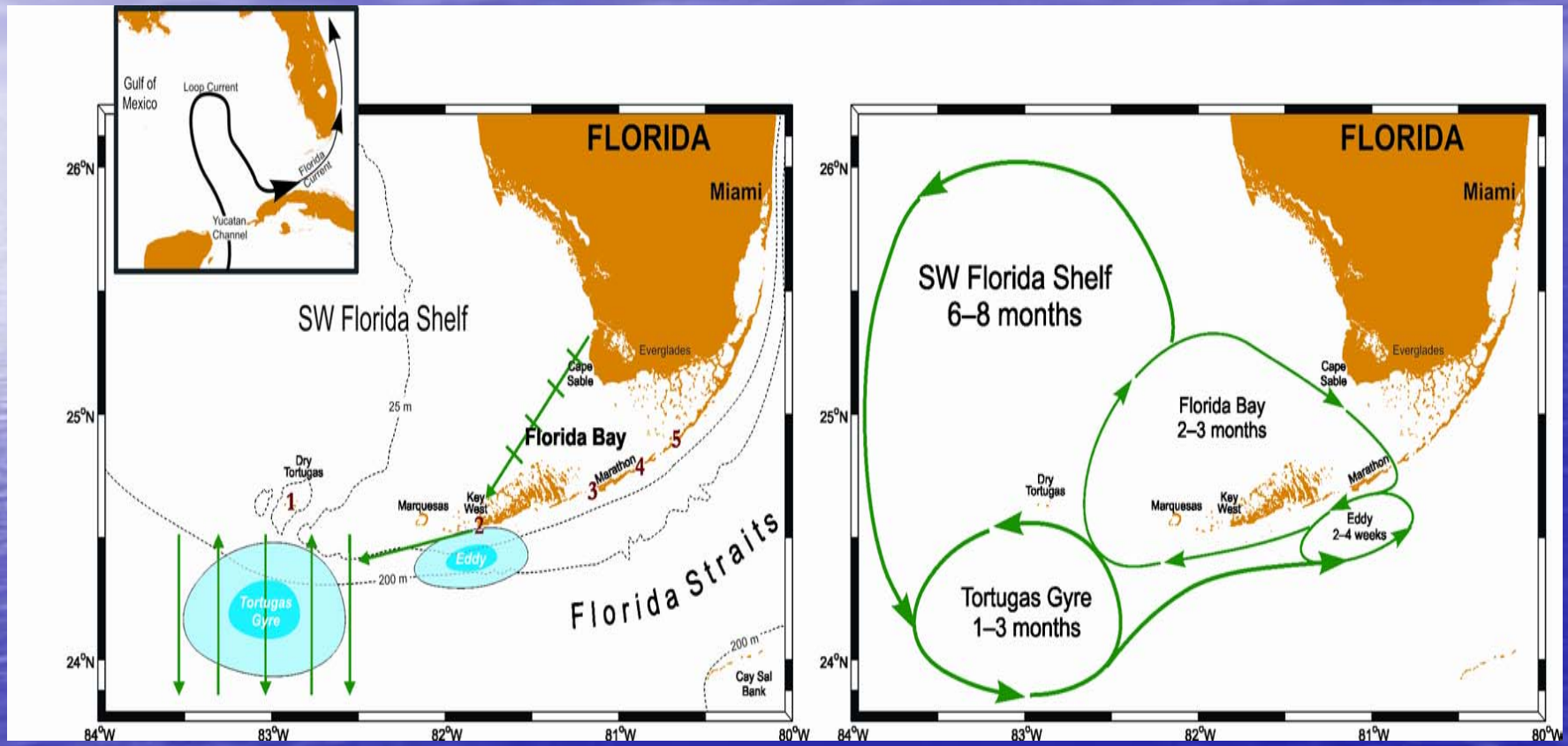
Here's a sketch of the surface flows in my neighborhood:



A lot of research has gone into understanding these flows.

Basic features:

- On average current speed is appx. 1 m./s.
- Net transport = 30 Svedrups (1 Sv. = 10^9 kg./s.)
- Supports eddy structures
- Formation of snap-off eddies that transport heat westward
- Highly variable bathymetry

Model Setup

Domain: 22.6 to 26.73N and 78.8W to 83.76W with 1/12^{o} resolution

which corresponds to 8km x 8km horizontal grid

"Nested" from larger domain by Wallcraft

Set up with 19 layers which cover the entire range of depths in the domain

Forcing: Comprehensive Ocean-Atmosphere Data Set (COADS) precipitation

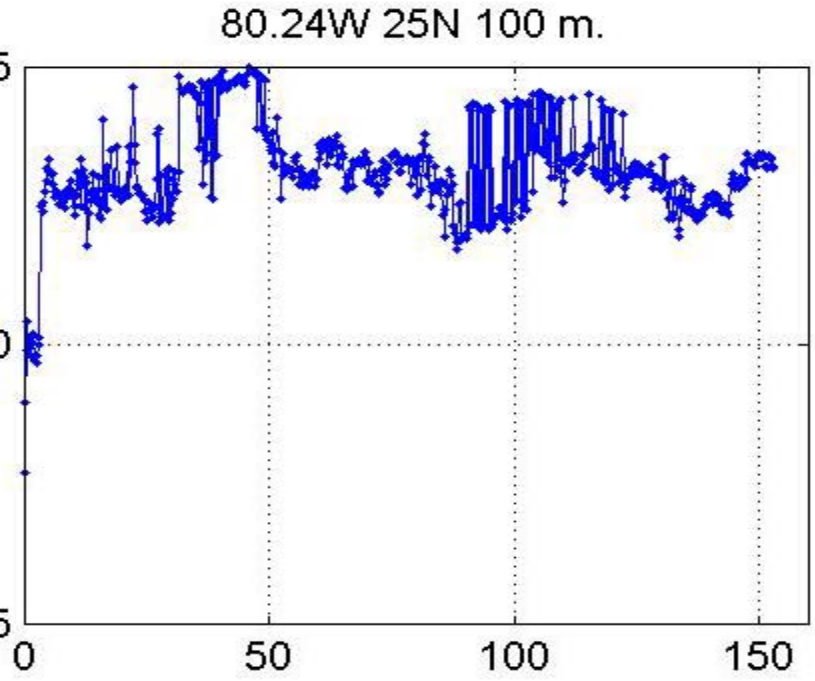
European Center for Medium-range Weather Forecasting (ECMWF) monthly forcing

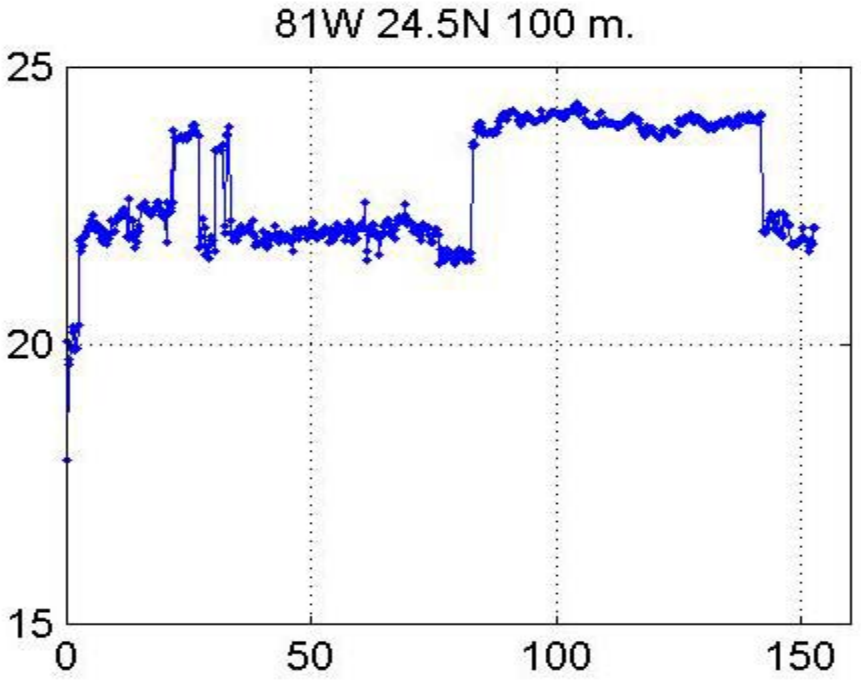
Levitus Climatology (density, salinity, potential temperature)

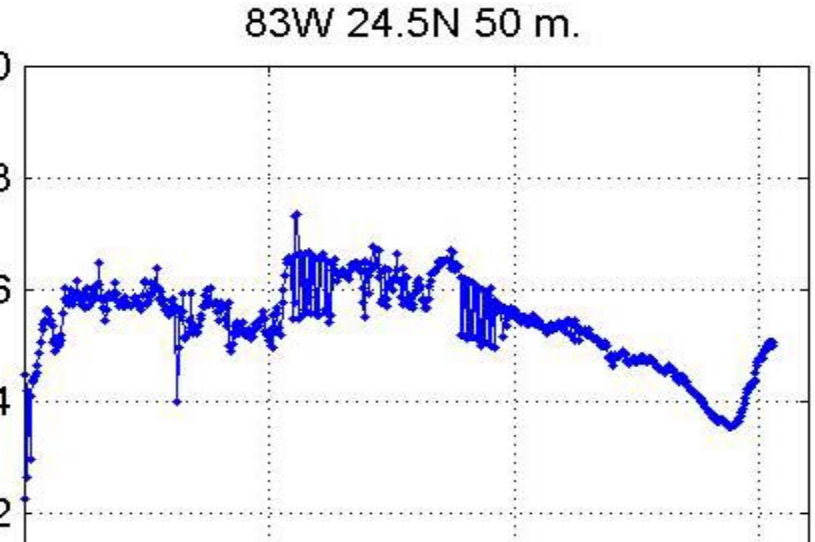
Baroclinic timestep 360s., barotropic timestep 30s.

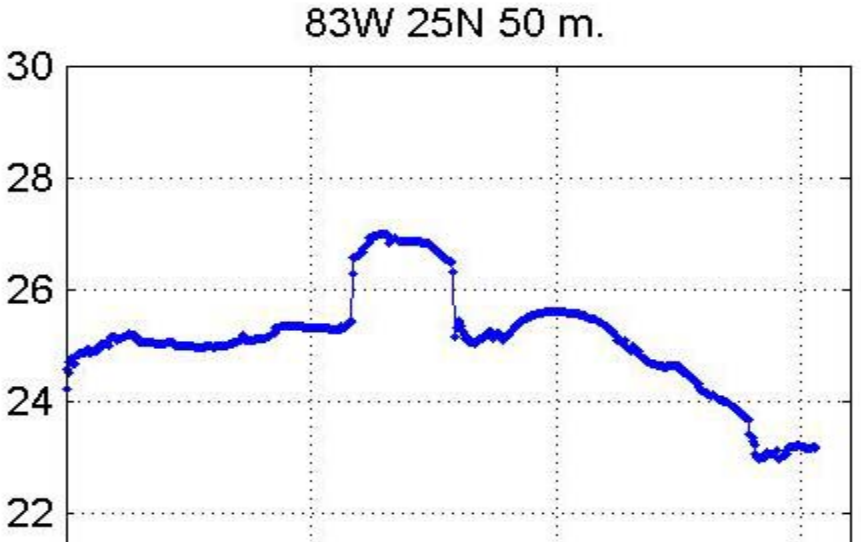
The next slides show temp, density and vertical velocity at different lat-lon and depth values.

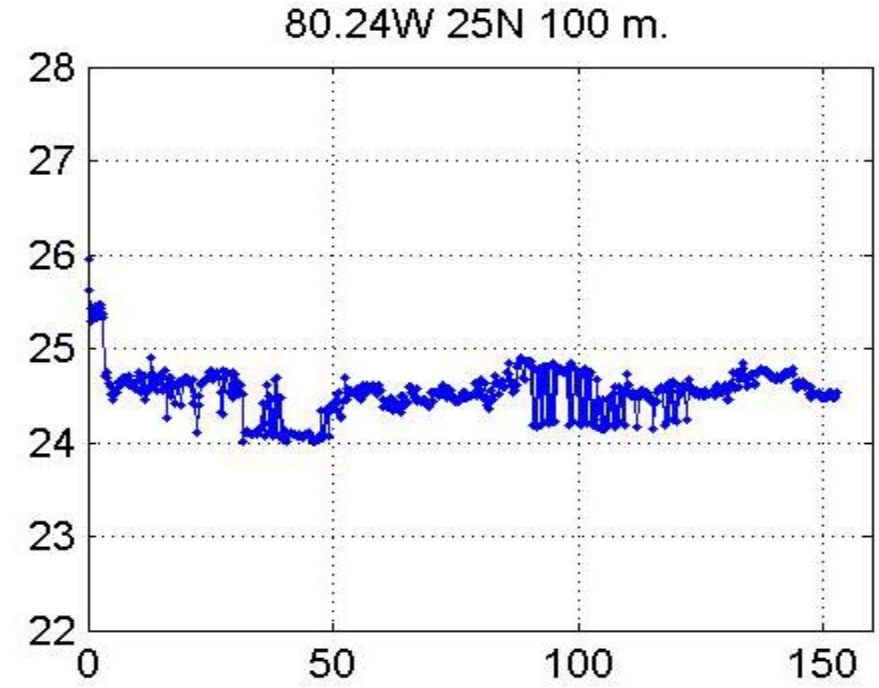
Here w is computed using a “new” algorithm introduced by Halliwell.

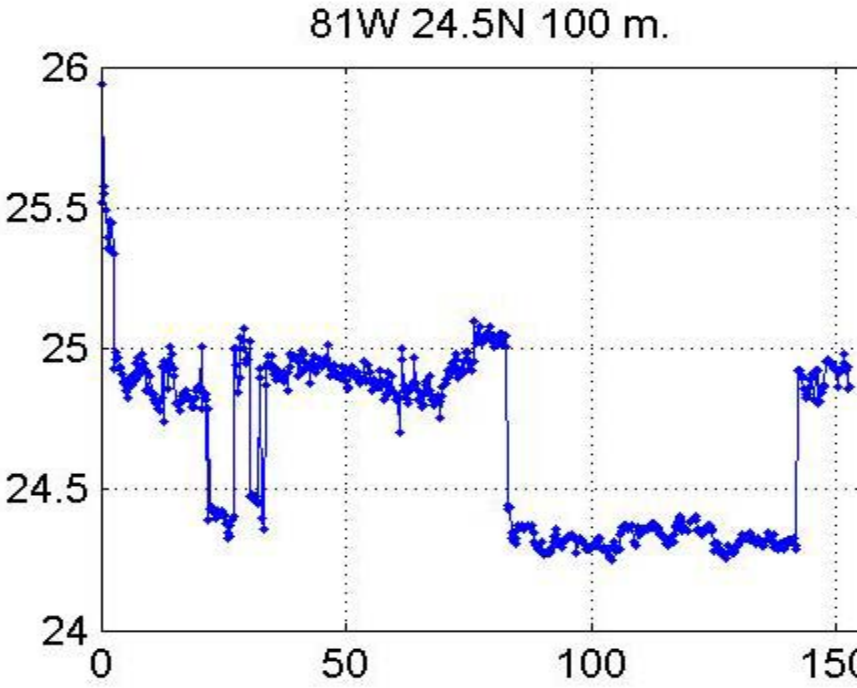

80.24W 25N 100 m.
0
50
100
150

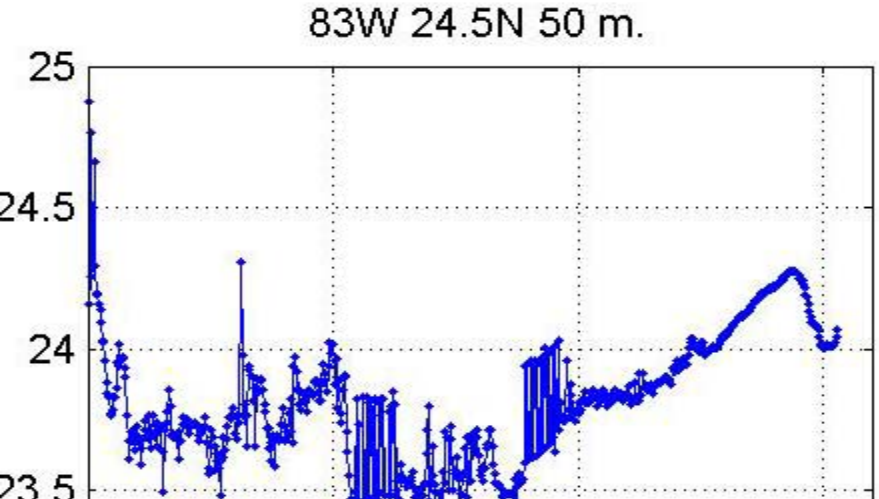

81W 24.5N 100 m.
25
20
15
0
50
100
150

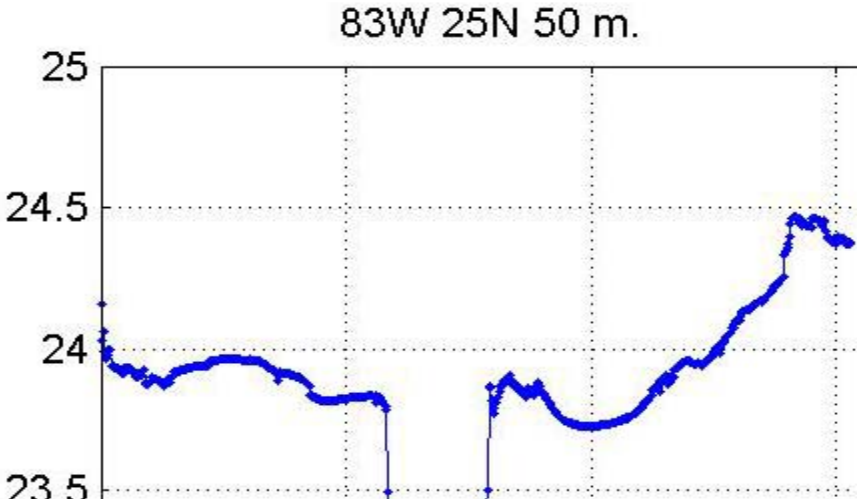

83W 24.5N 50 m.

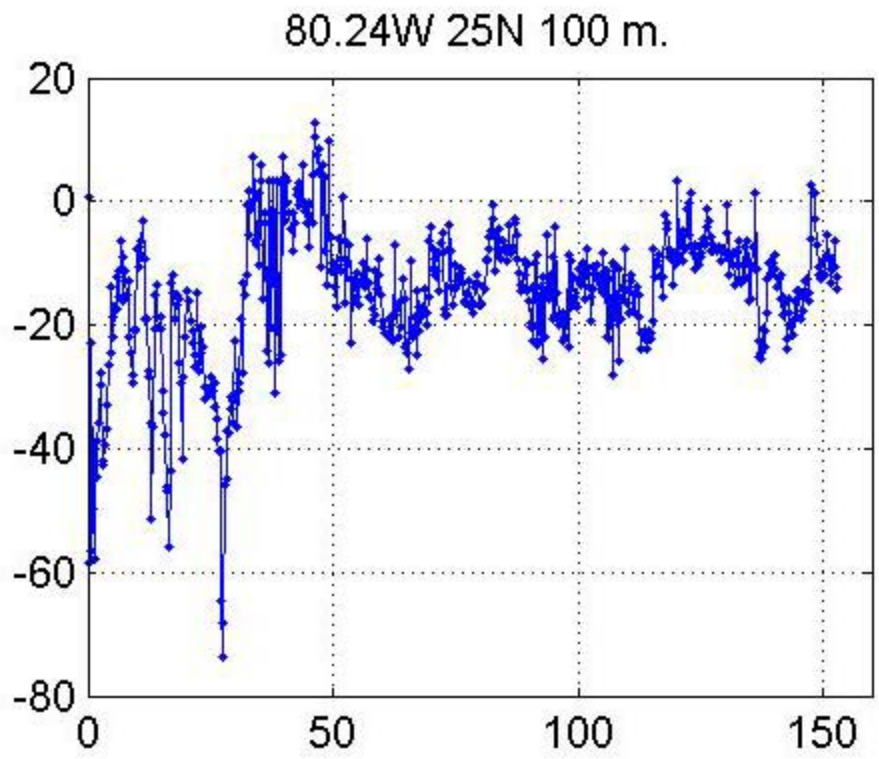

83W 25N 50 m.
30
28
26
24
22

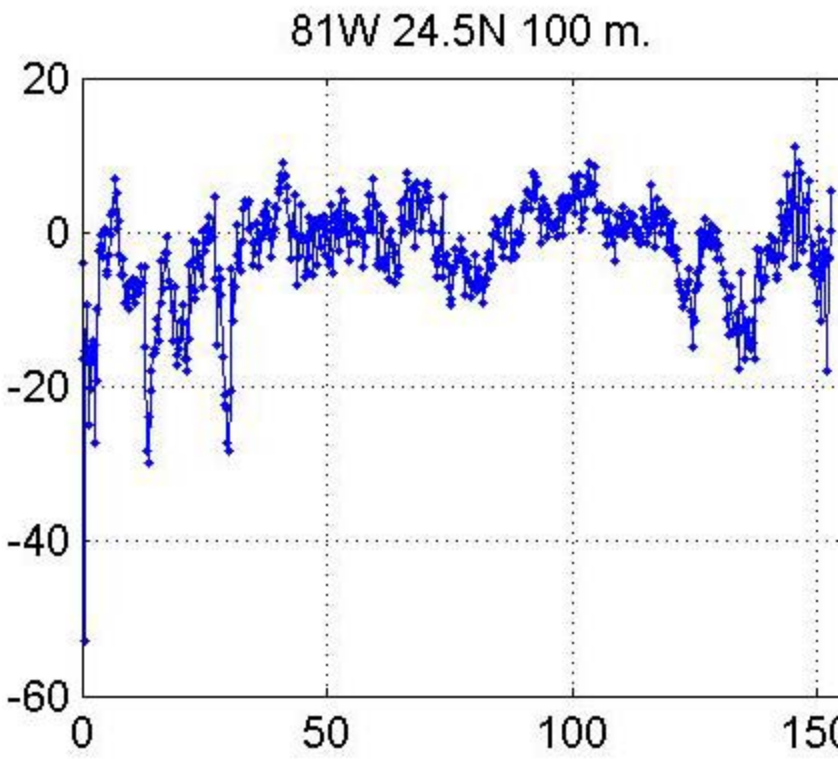

80.24W 25N 100 m.
28
27
26
25
24
23
22
0
50
100
150

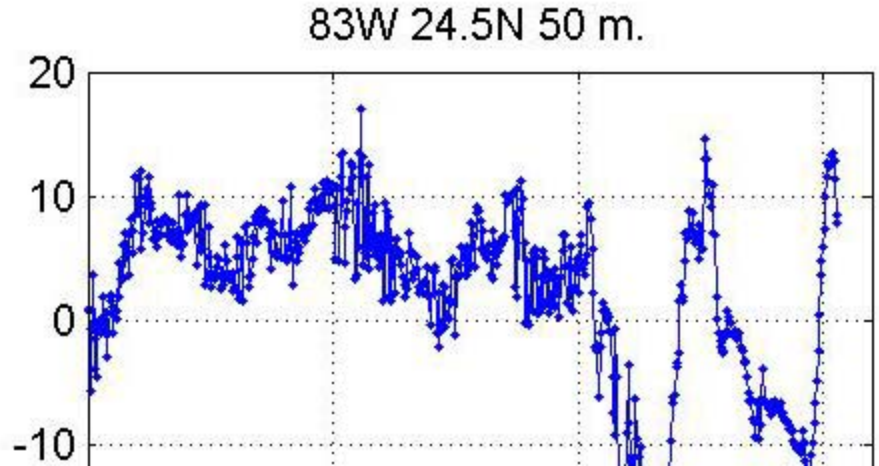

81W 24.5N 100 m.
26
25.5
25
24.5
24
0
50
100
150

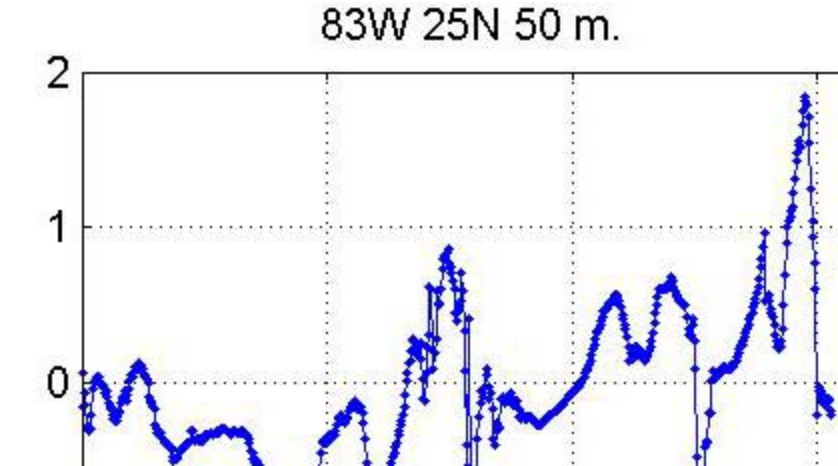

83W 24.5N 50 m.
25
24.5
24
23.5


83W 25N 50 m.
25
24.5
24
23.5


80.24W 25N 100 m.
20
0
-20
-40
-60
-80
0
50
100
150


81W 24.5N 100 m.
20
0
-20
-40
-60
0
50
100
150


83W 24.5N 50 m.
20
10
0
-10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2
1
0