Hurricane Force Winds in Explosive Maritime Cyclones

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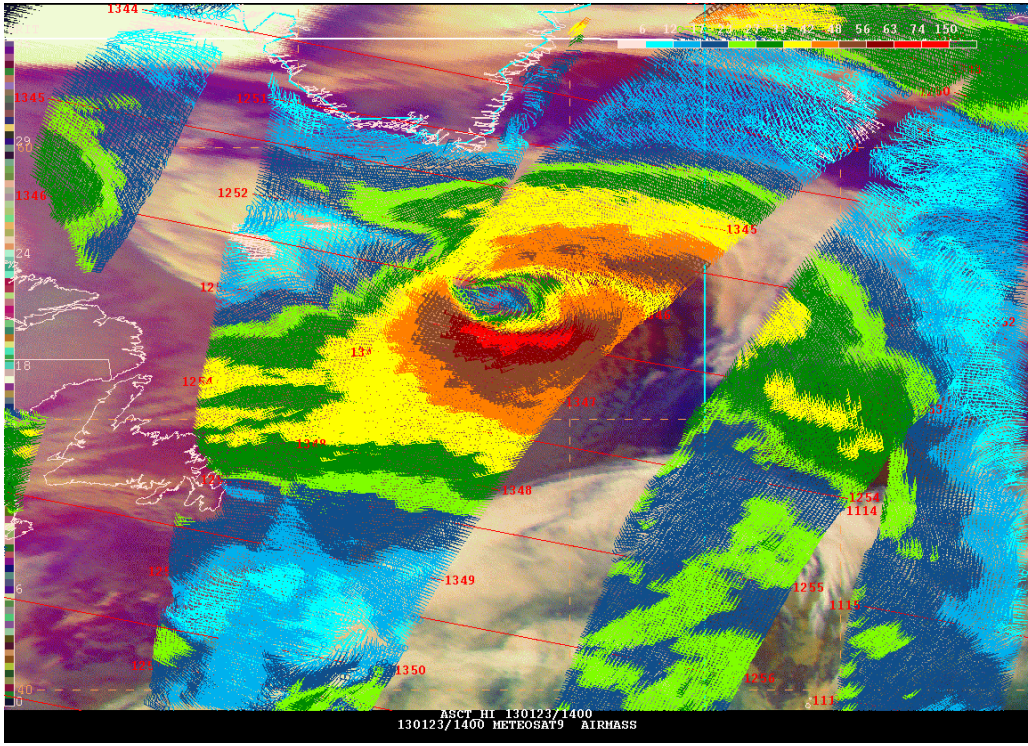
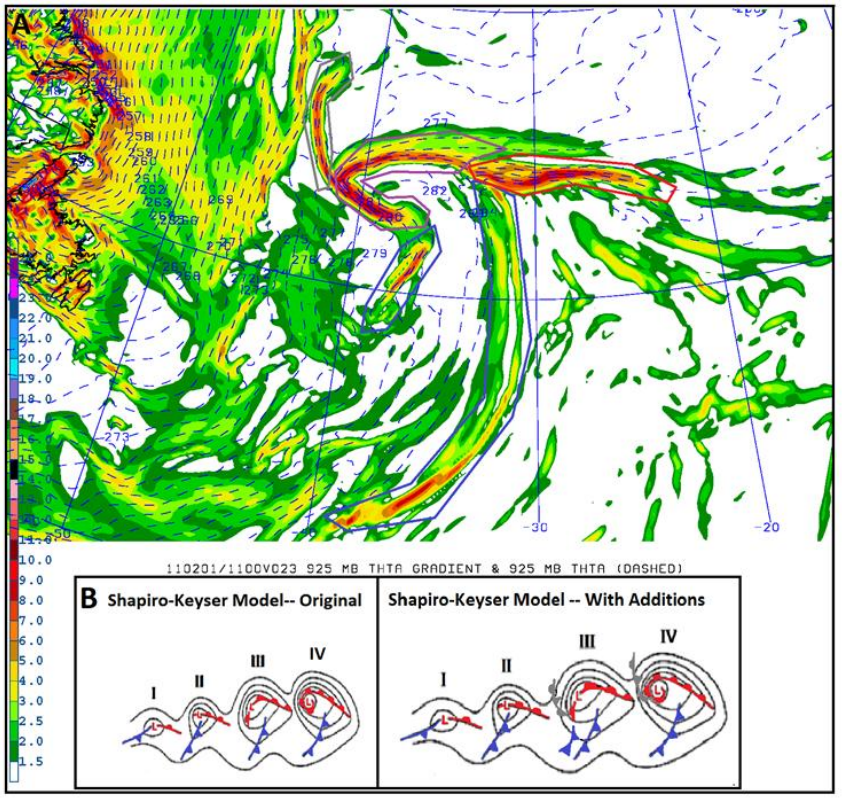
- 2 Case Studies
  - Jan 31-Feb 2, 2011
  - Jan 22 – 24, 2013
- Numerical simulations of cyclone evolutions with focus on wind structure and speed
  - WRF and NCEP NEMS
- Comparisons
  - ASCAT and OSCAT with NWP
  - NOAA WP-3D SFMR and dropsondes

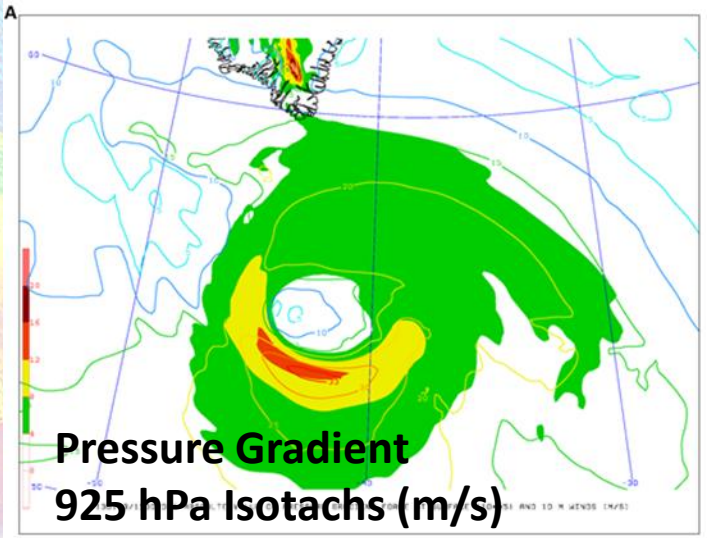


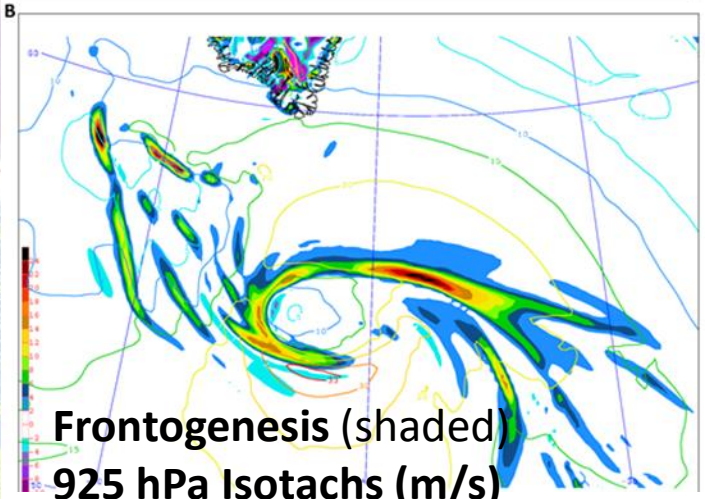
1346 ASCAT pass January 23, 2013.

The Evolution

- Strong frontogenesis develops
- Bent back front extends SEward
- Pressure Gradient Force (PGF) maximum develops
- PGF increases and wraps under cyclone center (south)
- Hurricane force winds develop within the PGF maximum and cold side of frontogenesis maximum

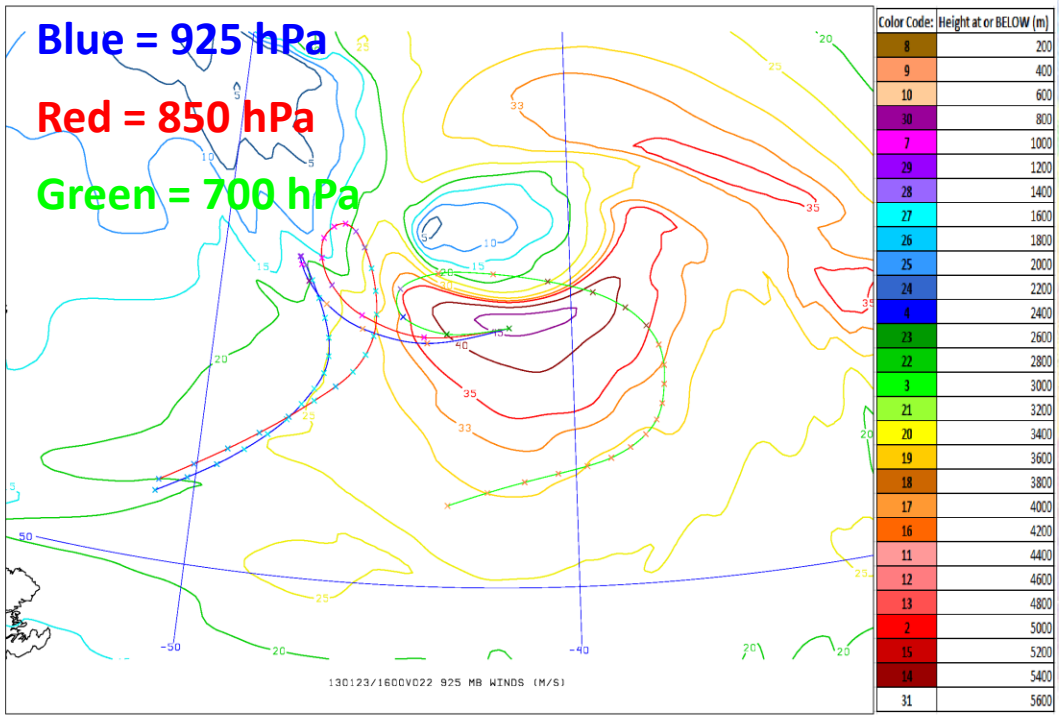






(A) *WRF modeled absolute value of surface pressure gradient force valid at 2100 UTC on January 23, 2013 and 10 m winds (m s^{-1}) isotachs with scale same as in Figure 6.* ***(B)*** *WRF modeled results from same time as in (A) and with same isotachs as (A) but with 925 hPa frontogenesis (K / 100 km / 3 h) shaded.*

Trajectories



Color Code:	Height at or BELOW (m)
8	200
9	400
10	600
30	800
7	1000
29	1200
28	1400
27	1600
26	1800
25	2000
24	2200
4	2400
23	2600
22	2800
3	3000
21	3200
20	3400
19	3600
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17	4000
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2	5000
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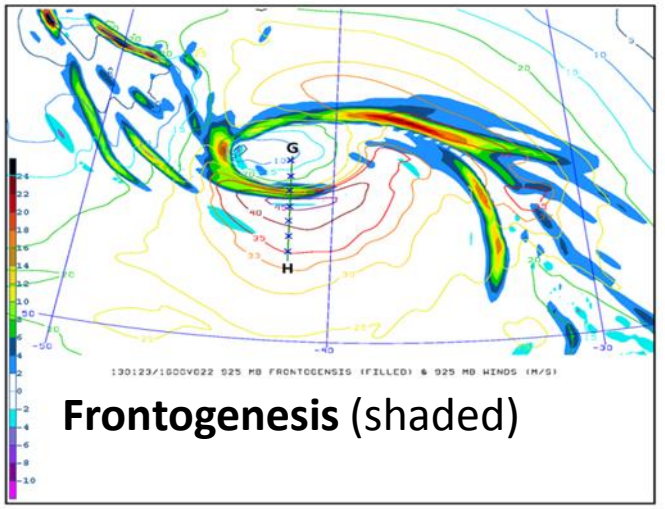
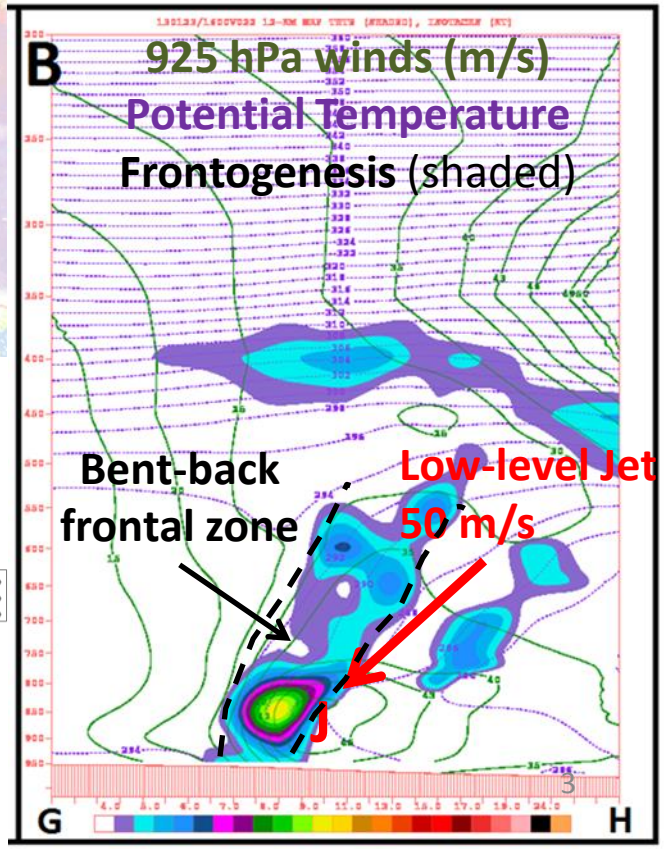
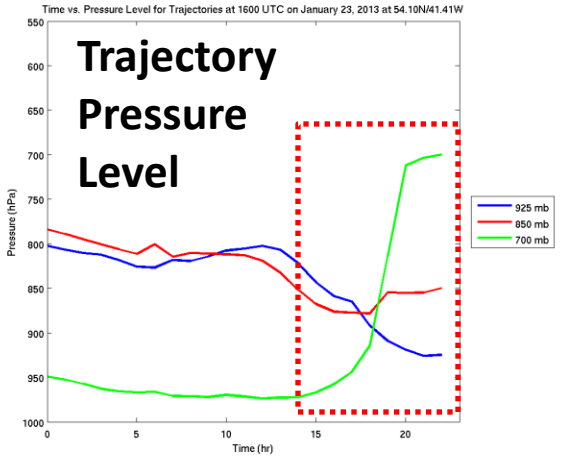
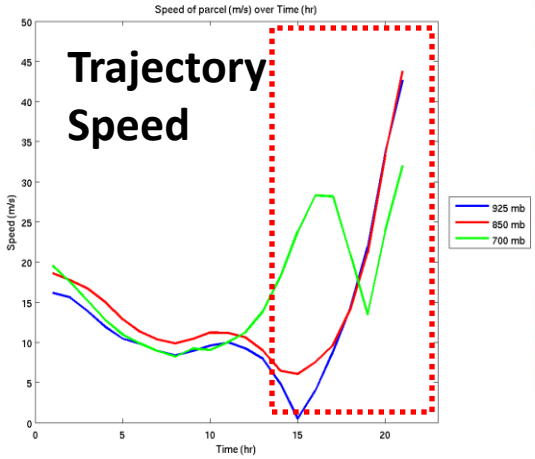
31	5600



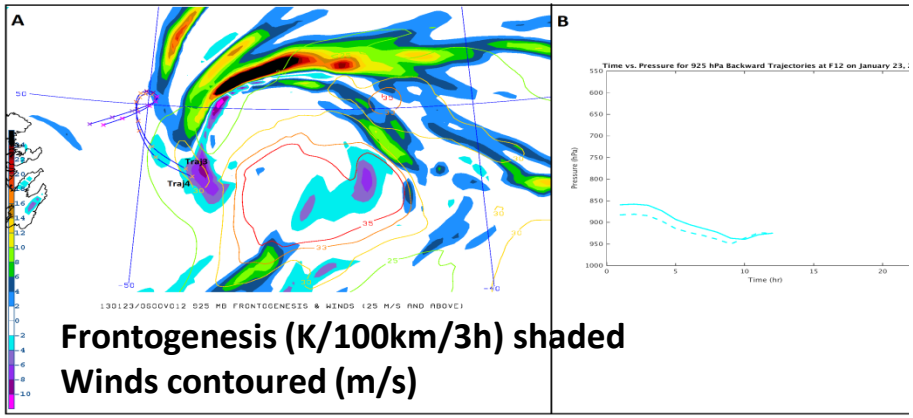
Frontogenesis (shaded)



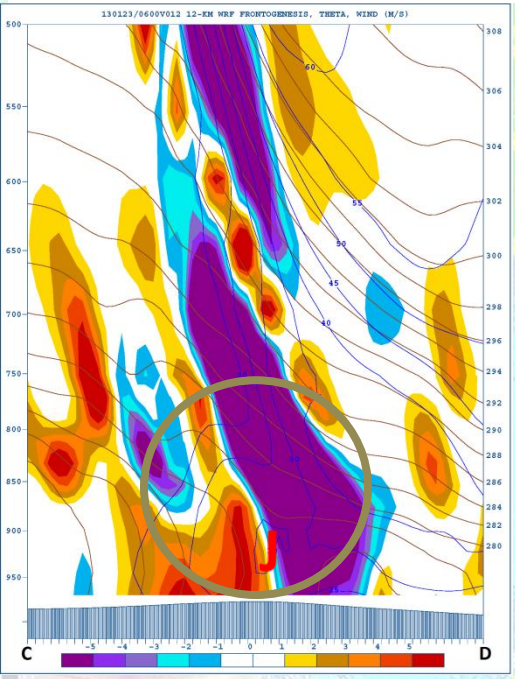


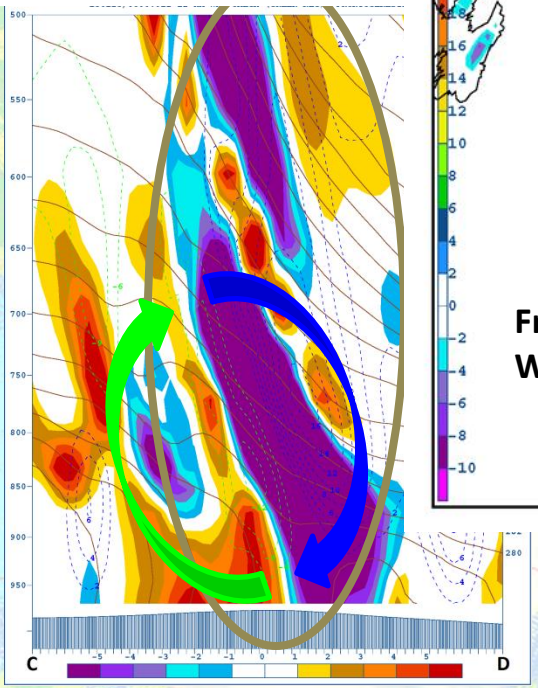


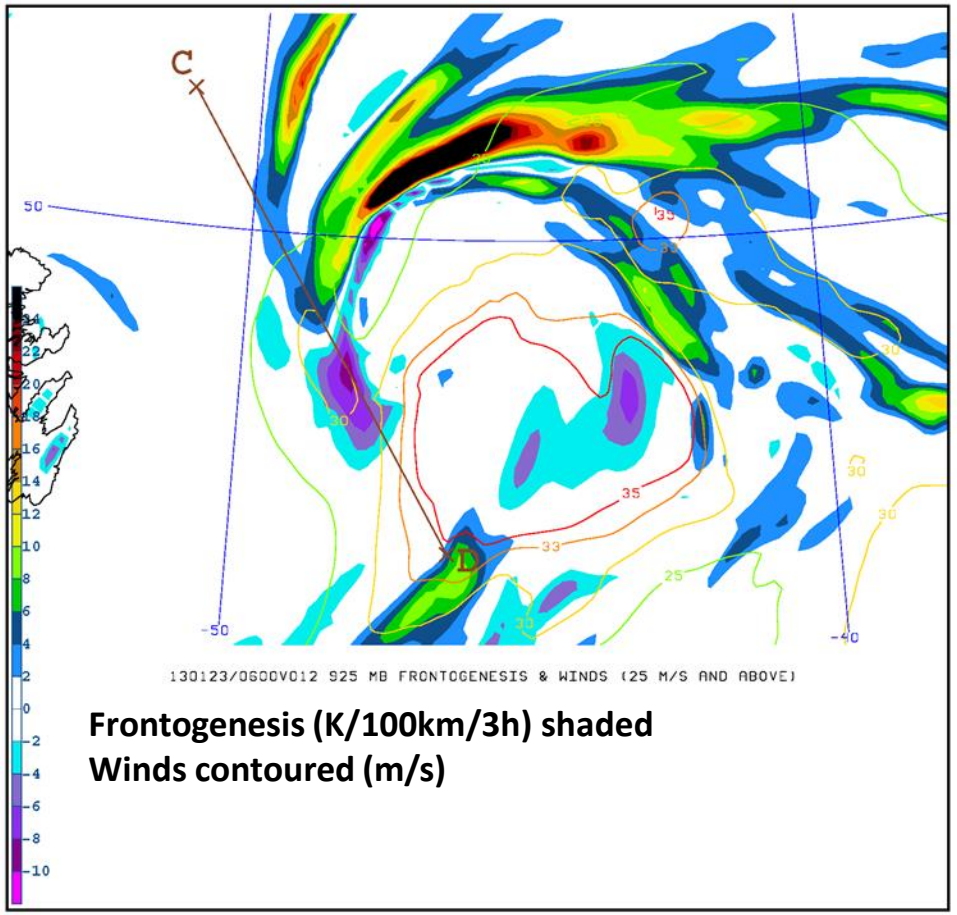
2013 possible Sting Jet



Frontogenesis (K/100km/3h) shaded
Winds contoured (m/s)







Frontogenesis (K/100km/3h) shaded
Winds contoured (m/s)

Omega (mb/s):
Neg. Green (rising air)
Pos. Blue (sinking air)

Summary

- Evolution is common
  - Based on scatterometer winds
- HF Winds result of low level jet formation
  - Some similarity to cold conveyer belt or jet
  - **Not** a sting jet (terminology frequently misused)
    - NWP results showed potential sting jets earlier in evolutions
- Predictable
  - Based on scale, evolution, and operational NWP
- Aug 2014 – April 2015 observed HF storms
  - 30 Pacific, 50 Atlantic