The influence of convection and midlatitude air on the water vapor and isotopic composition of the upper TTL and tropical stratosphere

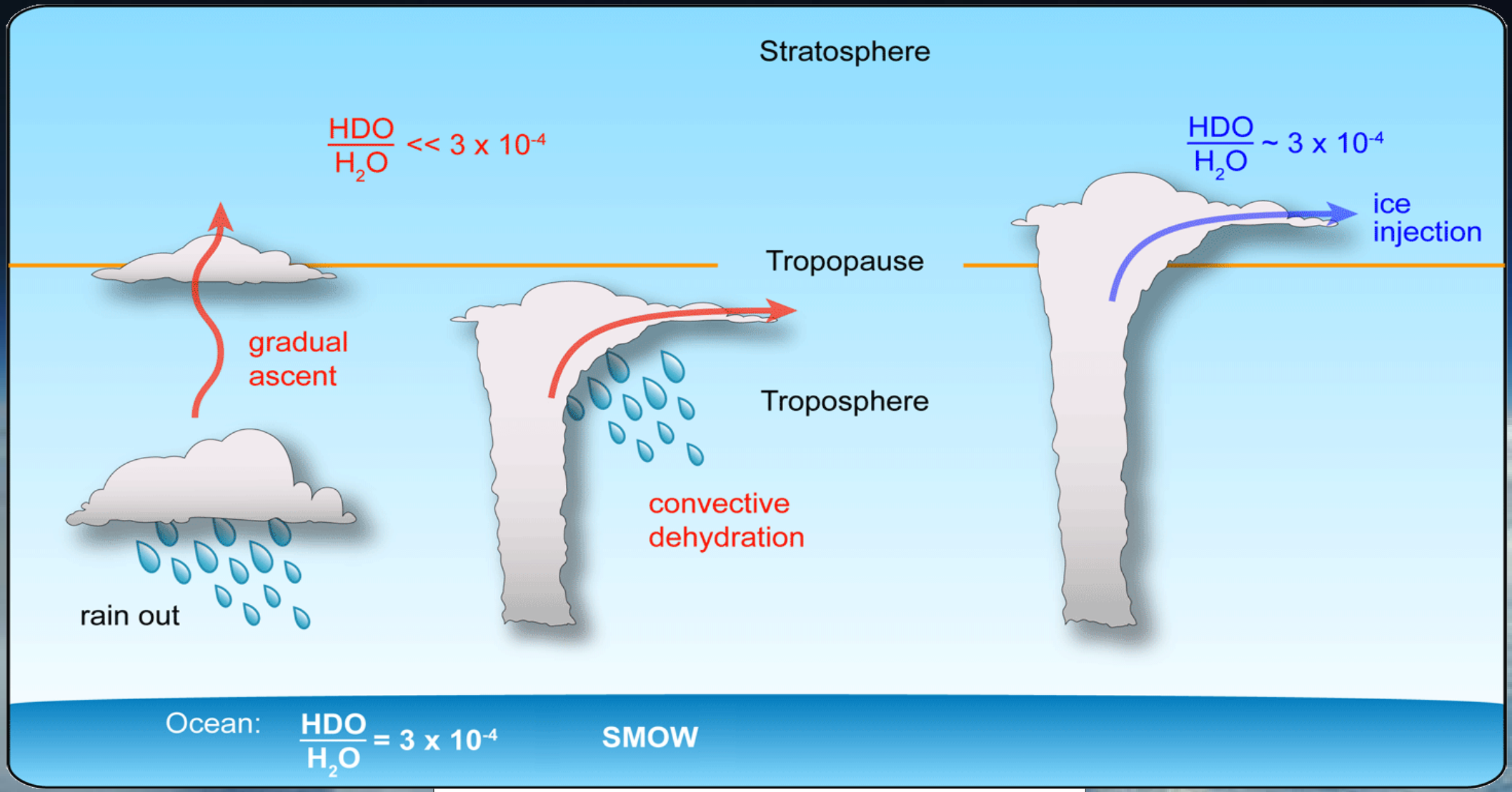
David Sayres

Harvard University

- ICOS (H_2O Isotopes) – D. Sayres, E. Moyer, T. Hanisco, J. St.Clair
- MMS (T, P, θ) - P. Bui
- MLS (H_2O) – W. Read
- BackTrajectories – M. Schoeberl, L. Lait, P. Newman

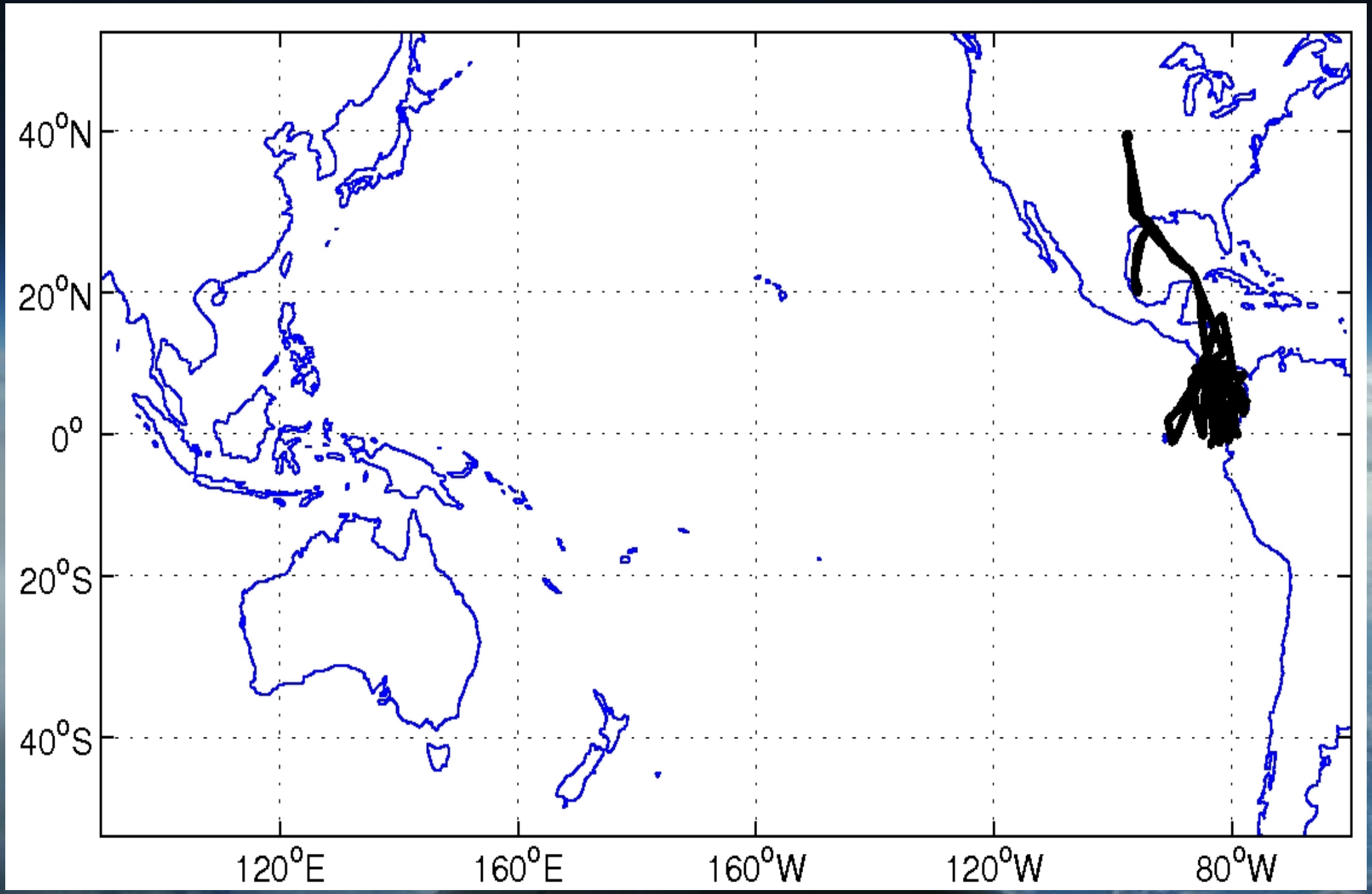
Aura Science Team Meeting, September 2006

Water Isotopes

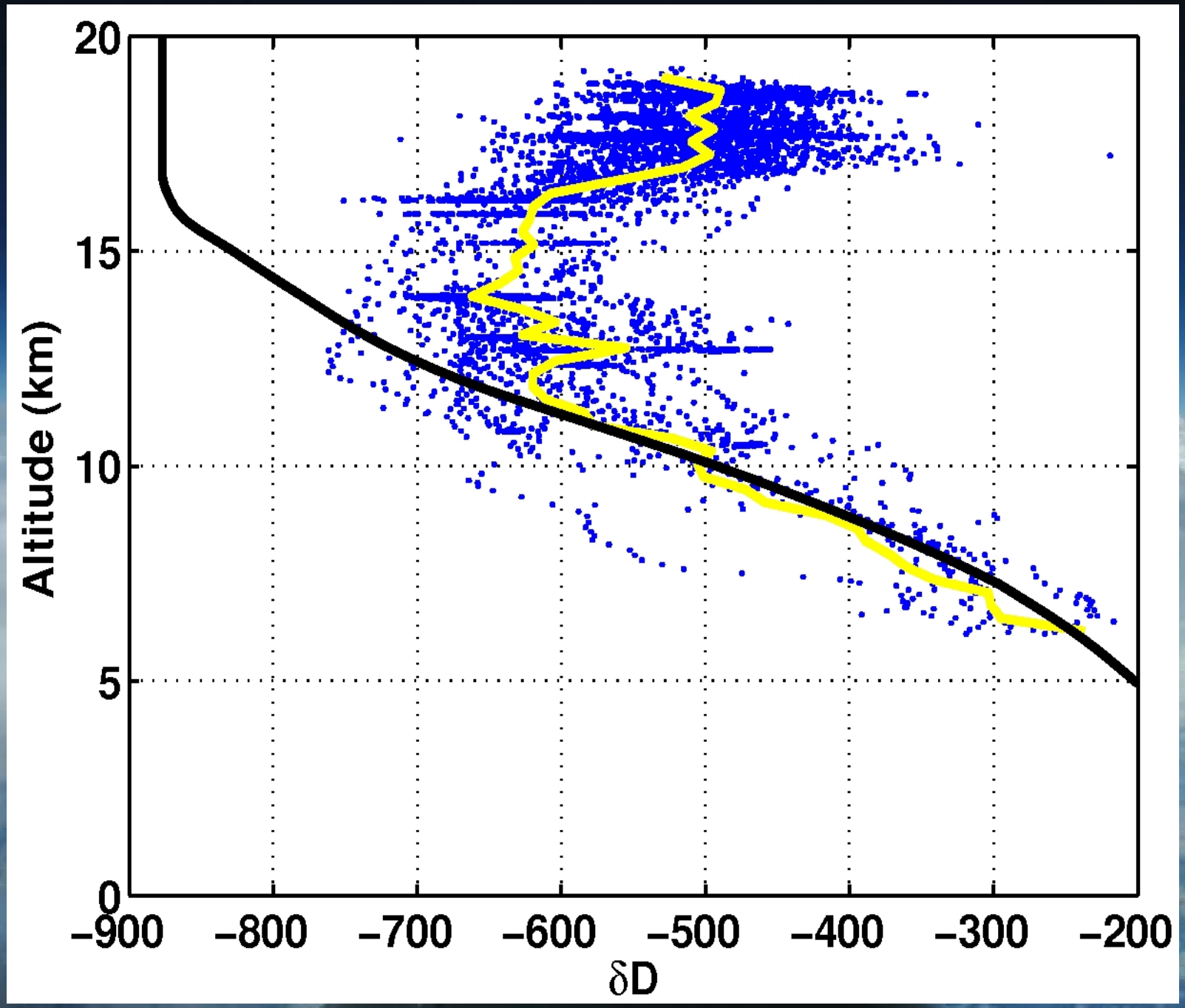


$$\delta D = \left(\frac{[HDO]/[H_2O]}{R_{SMOW}} - 1 \right) * 1000$$

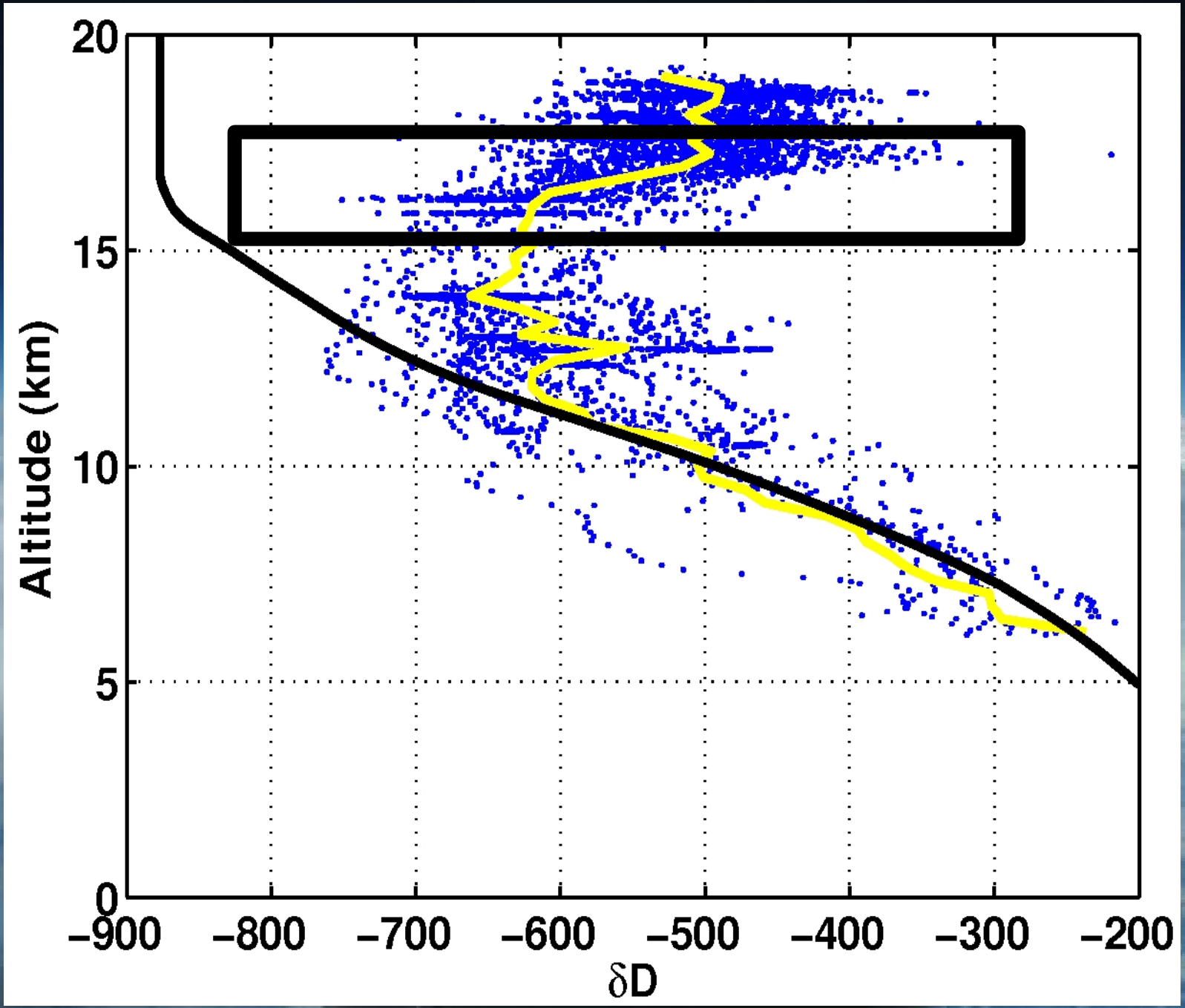
CR-AVE Mission



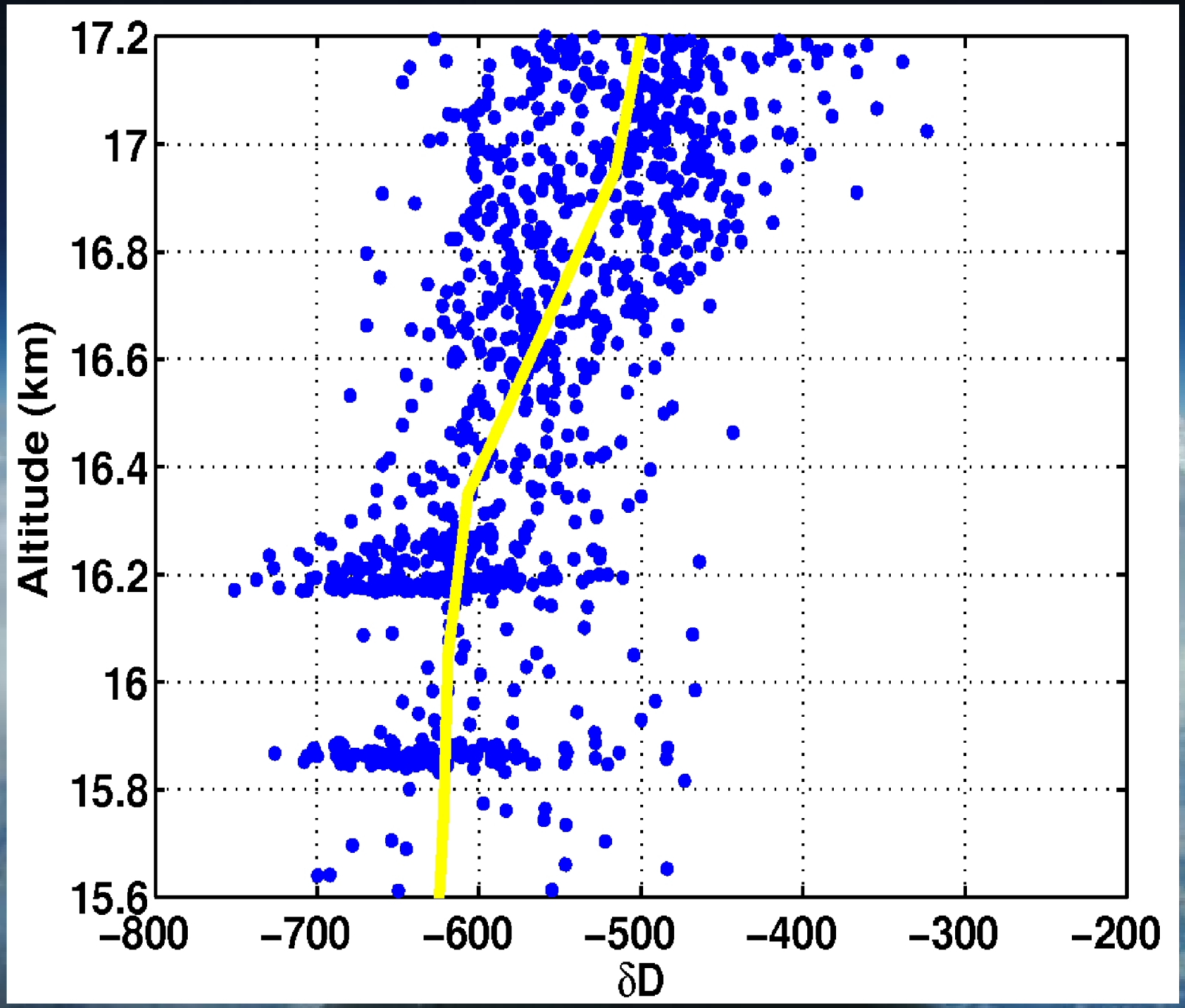
Water Isotope Measurements - CR-AVE



Water Isotope Measurements - CR-AVE



Water Isotope Measurements - CR-AVE



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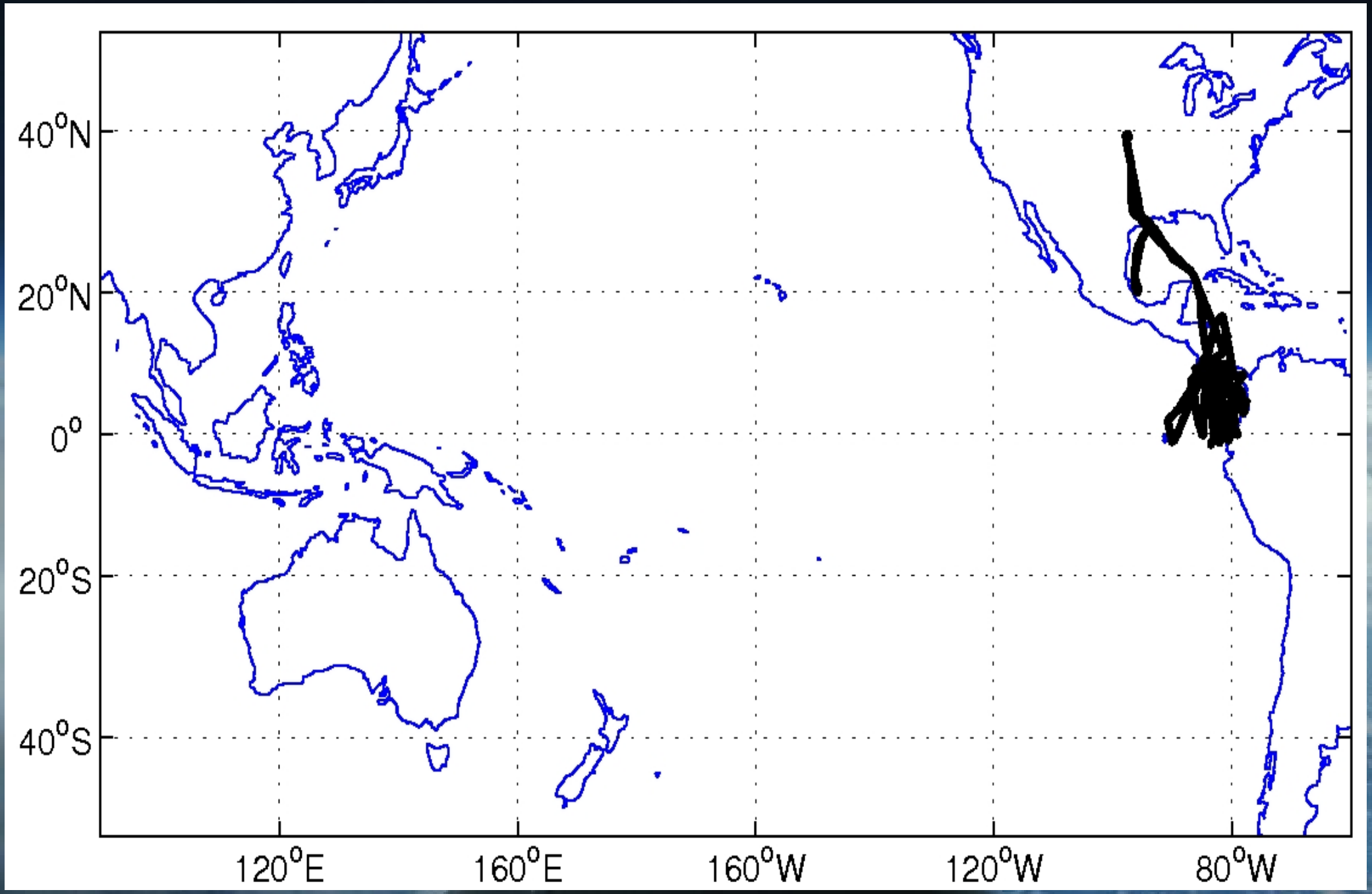

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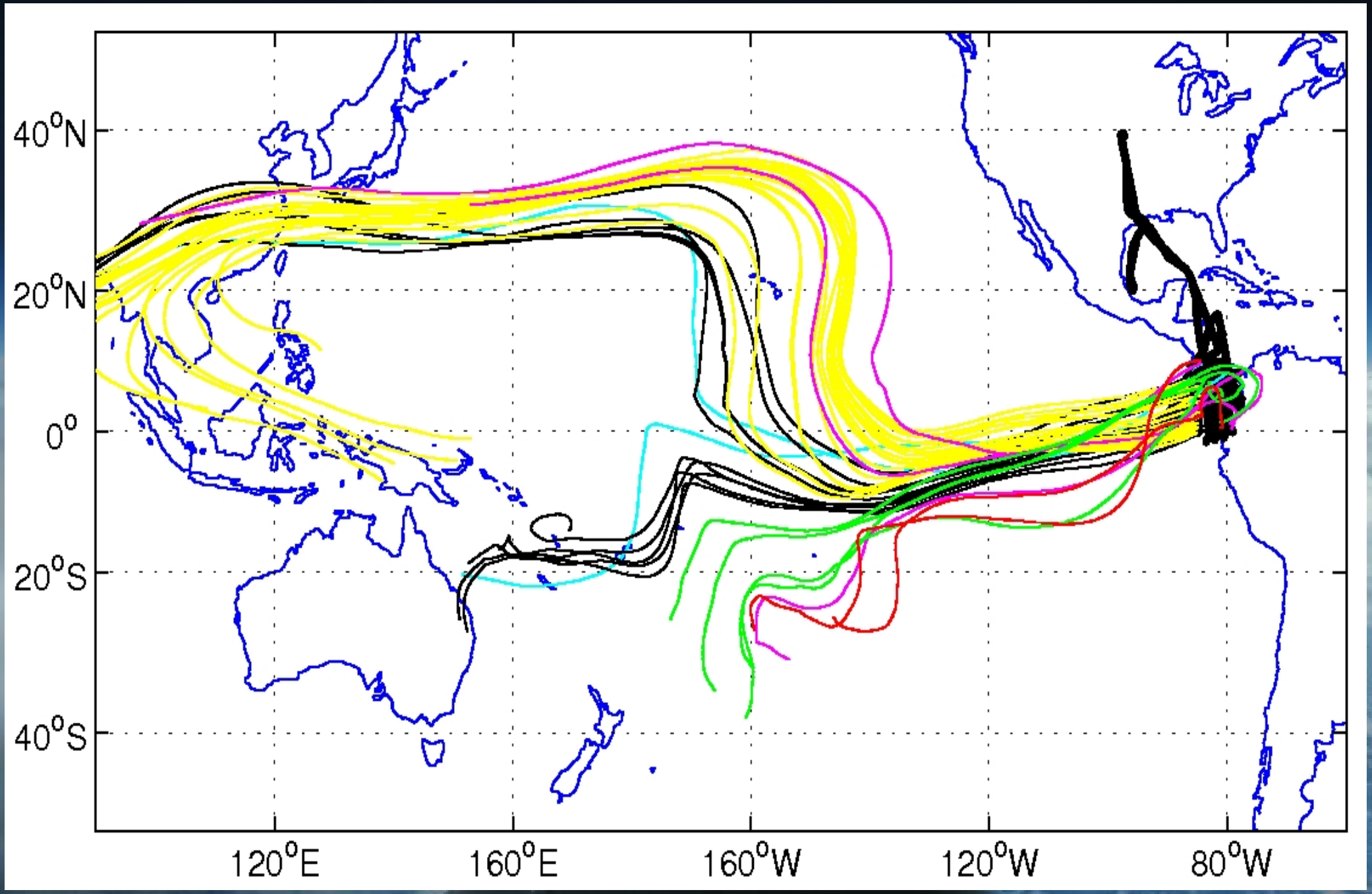

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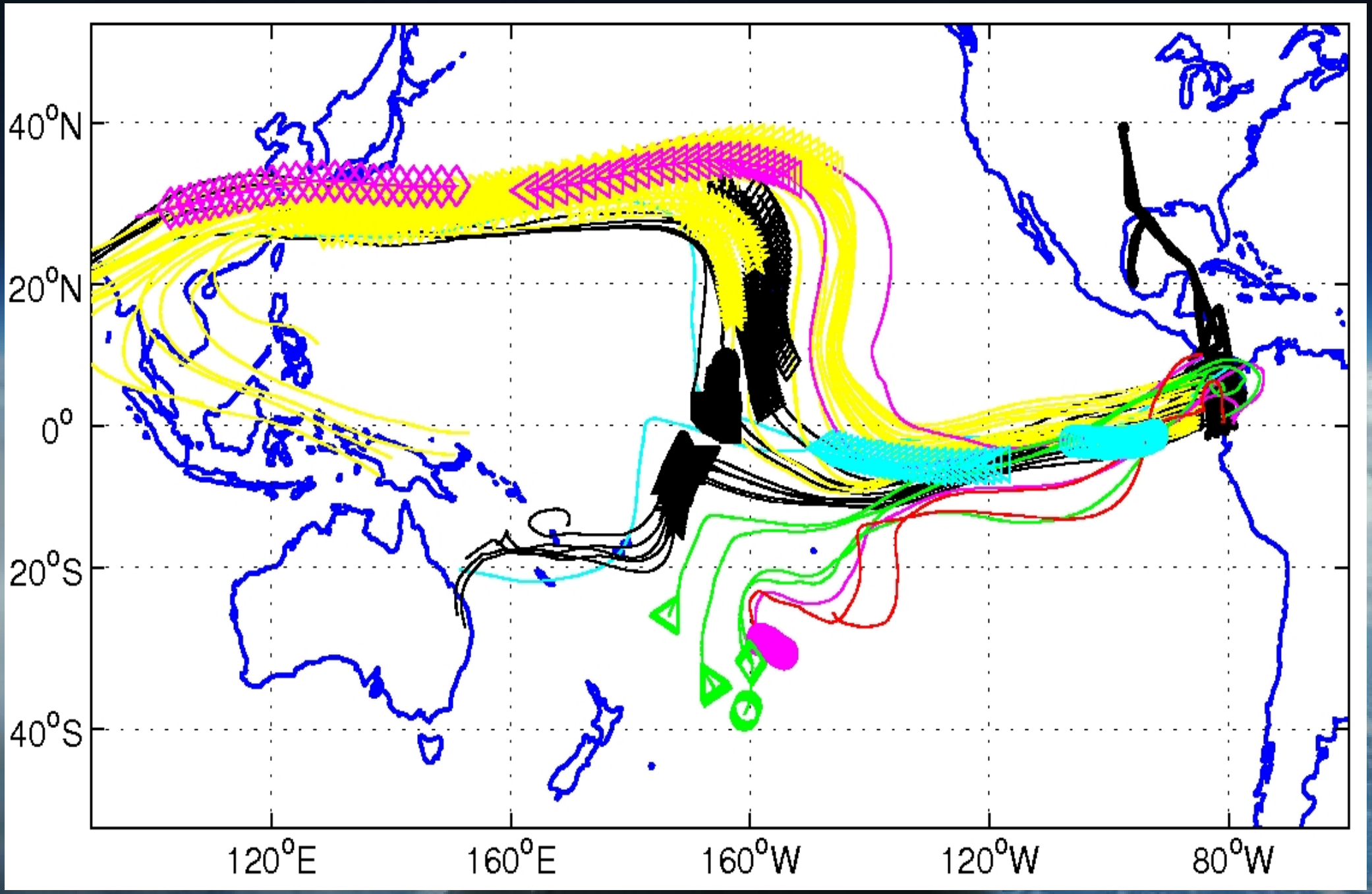
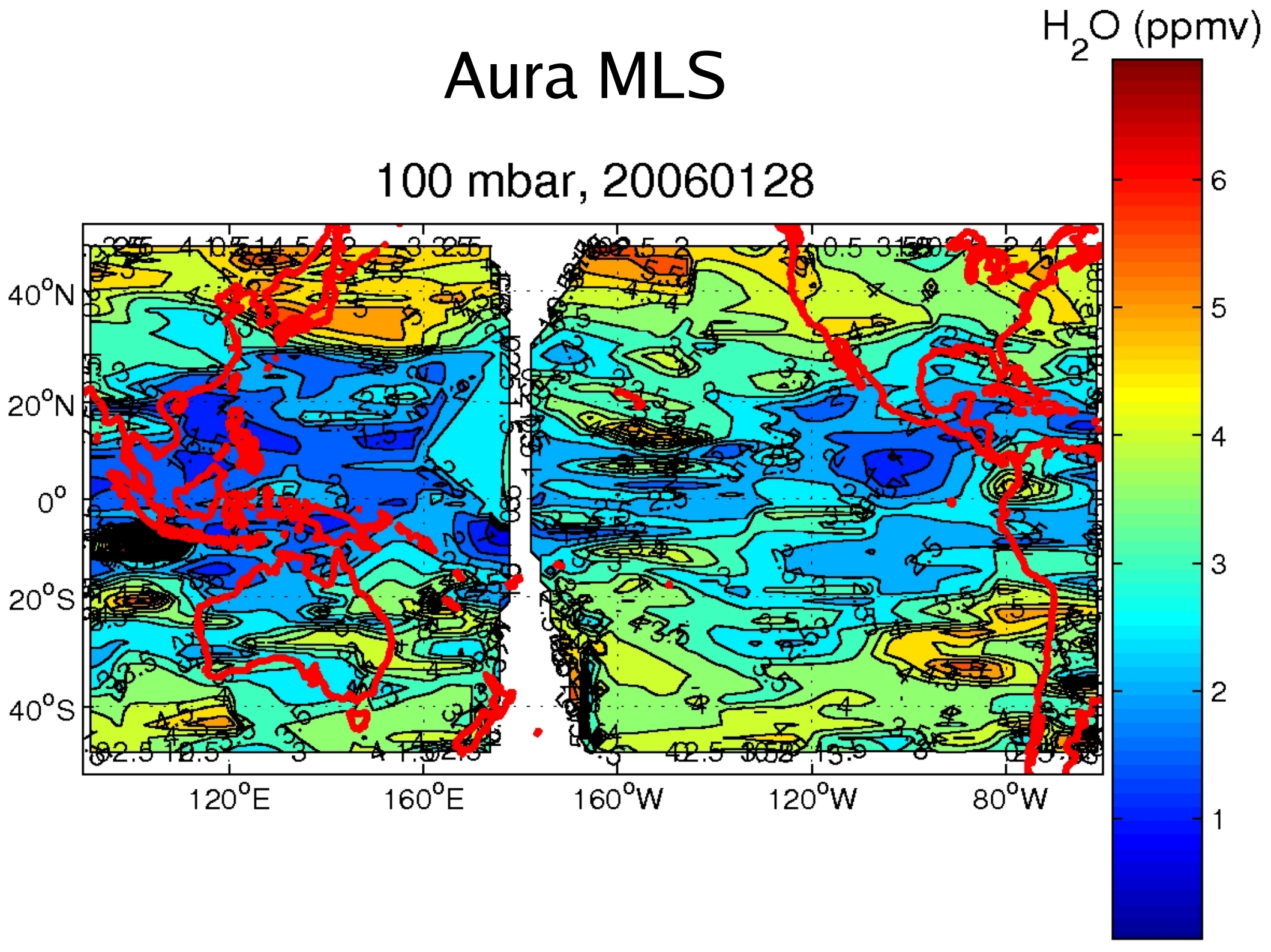
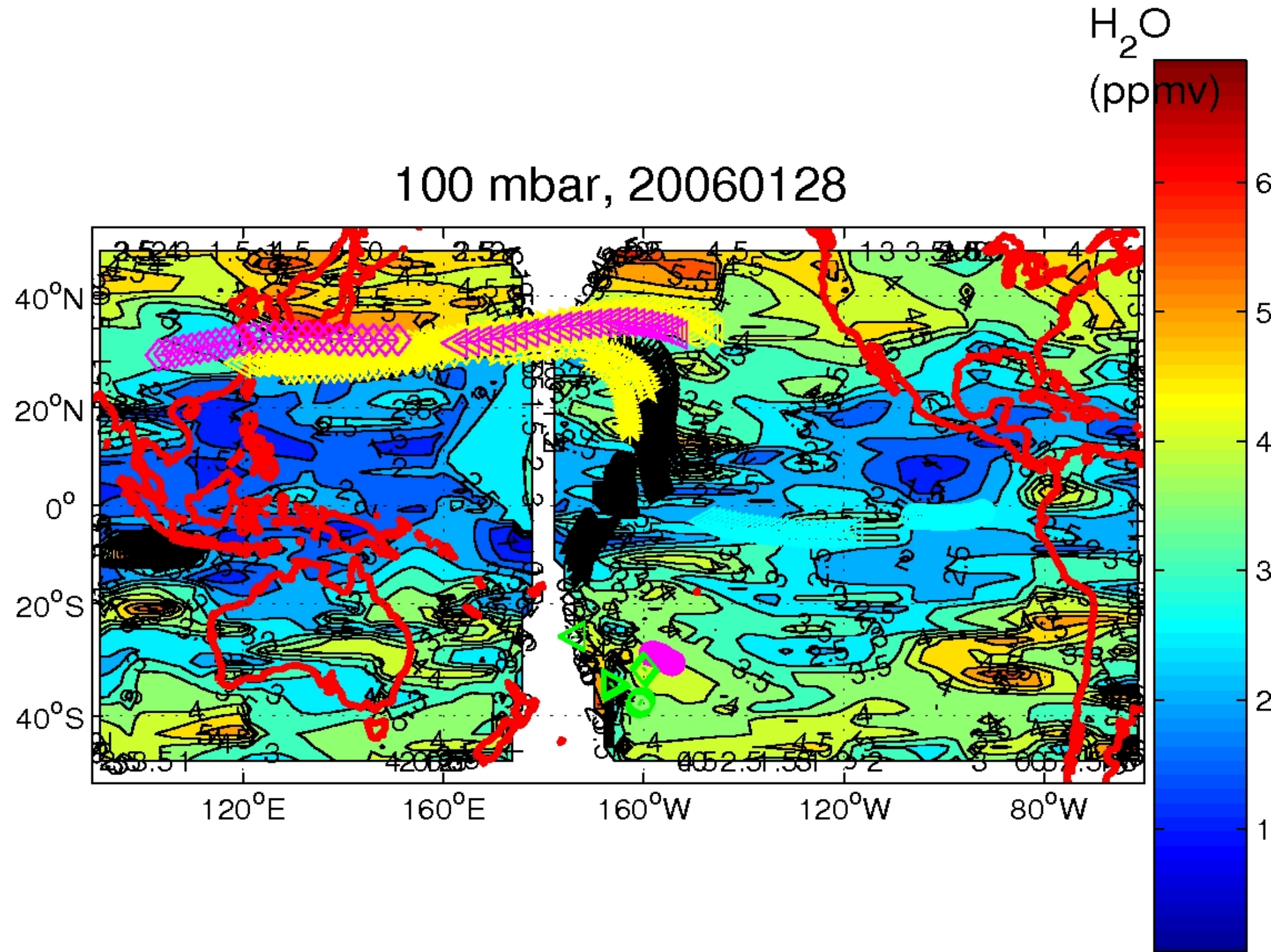
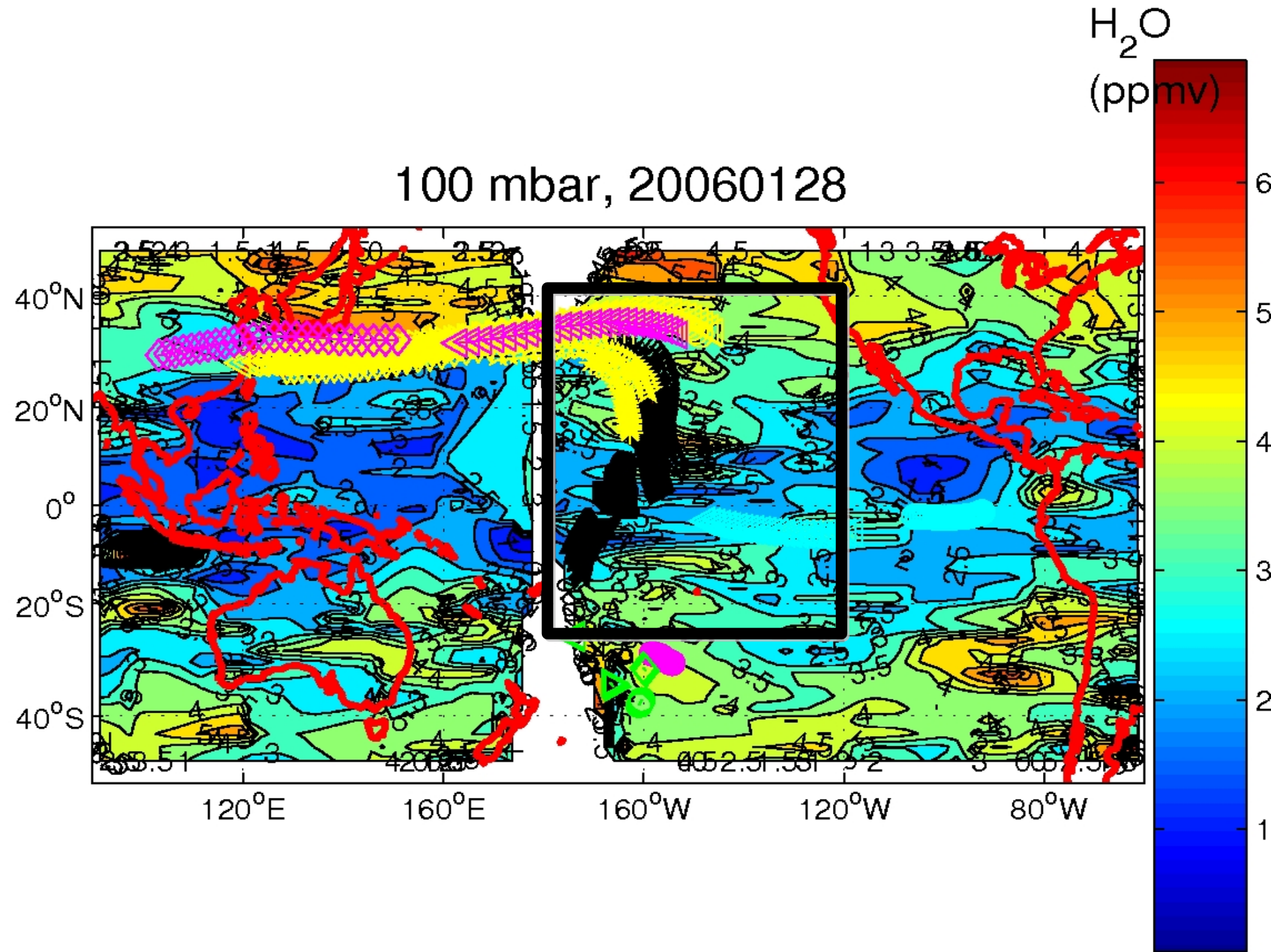
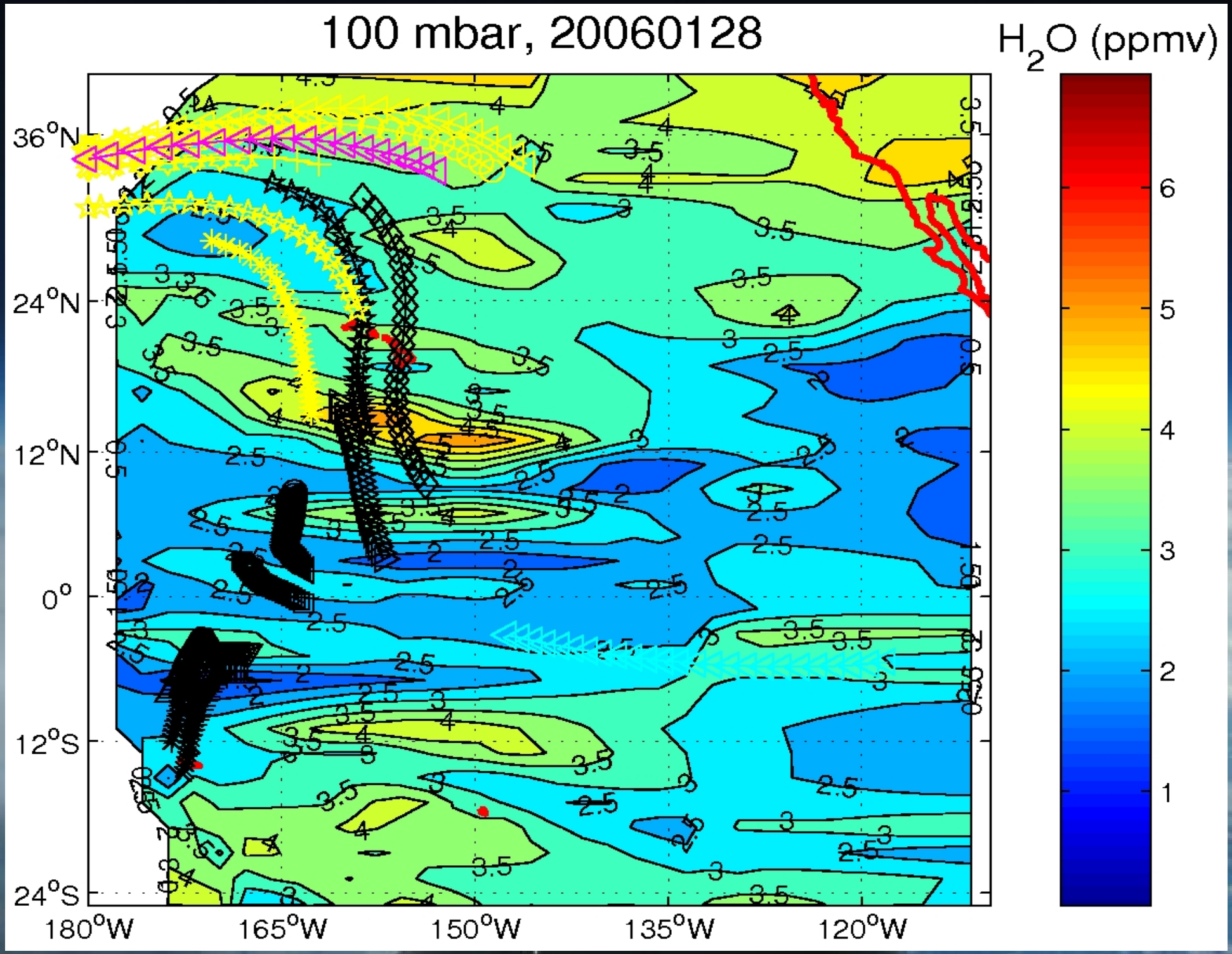


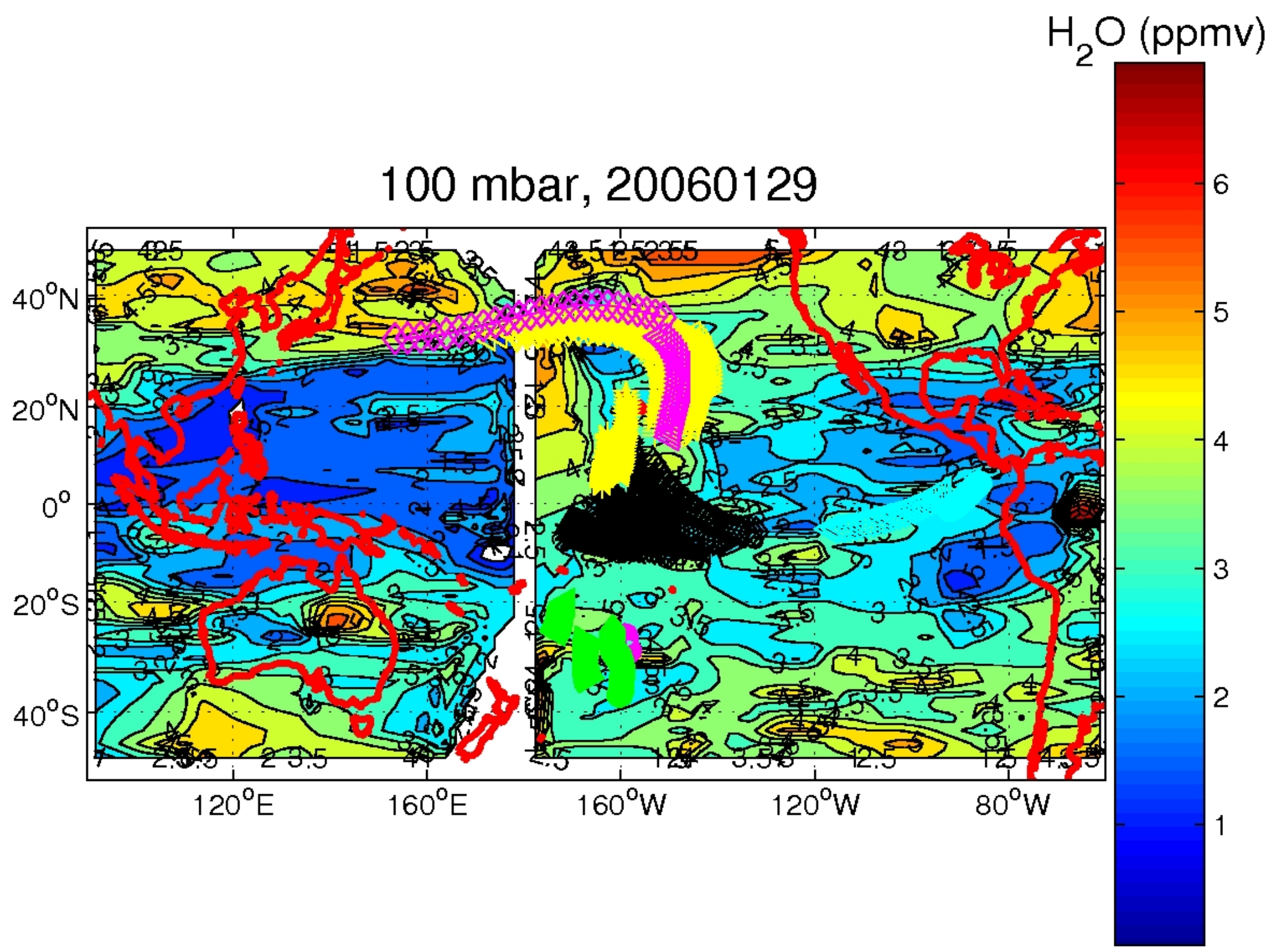
Aura MLS

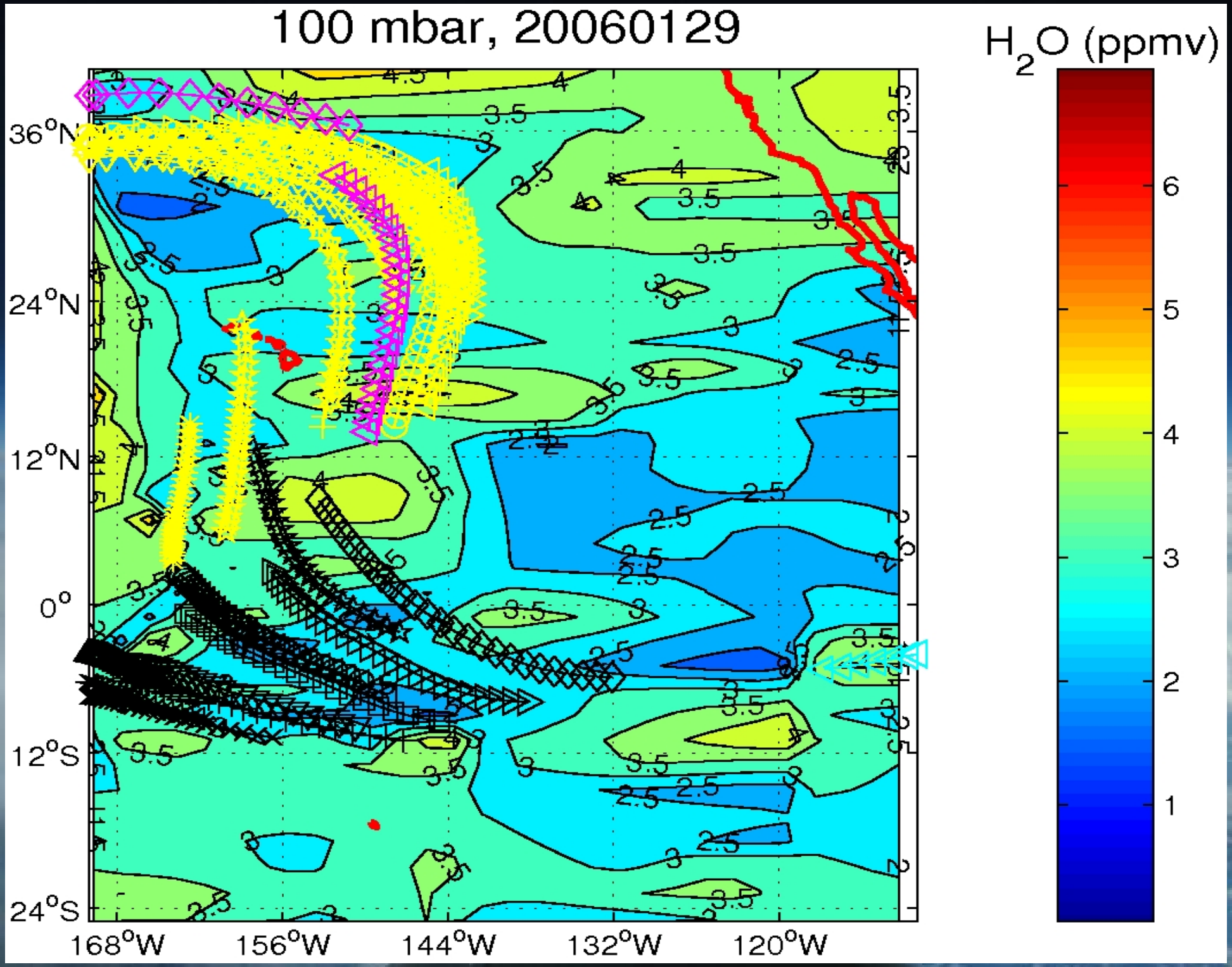

100 mbar, 20060128
H2O (ppmv)
6
5
4
3
2
1
40°N
20°N
0°
20°S
40°S
120°E
160°E
160°W
120°W
80°W

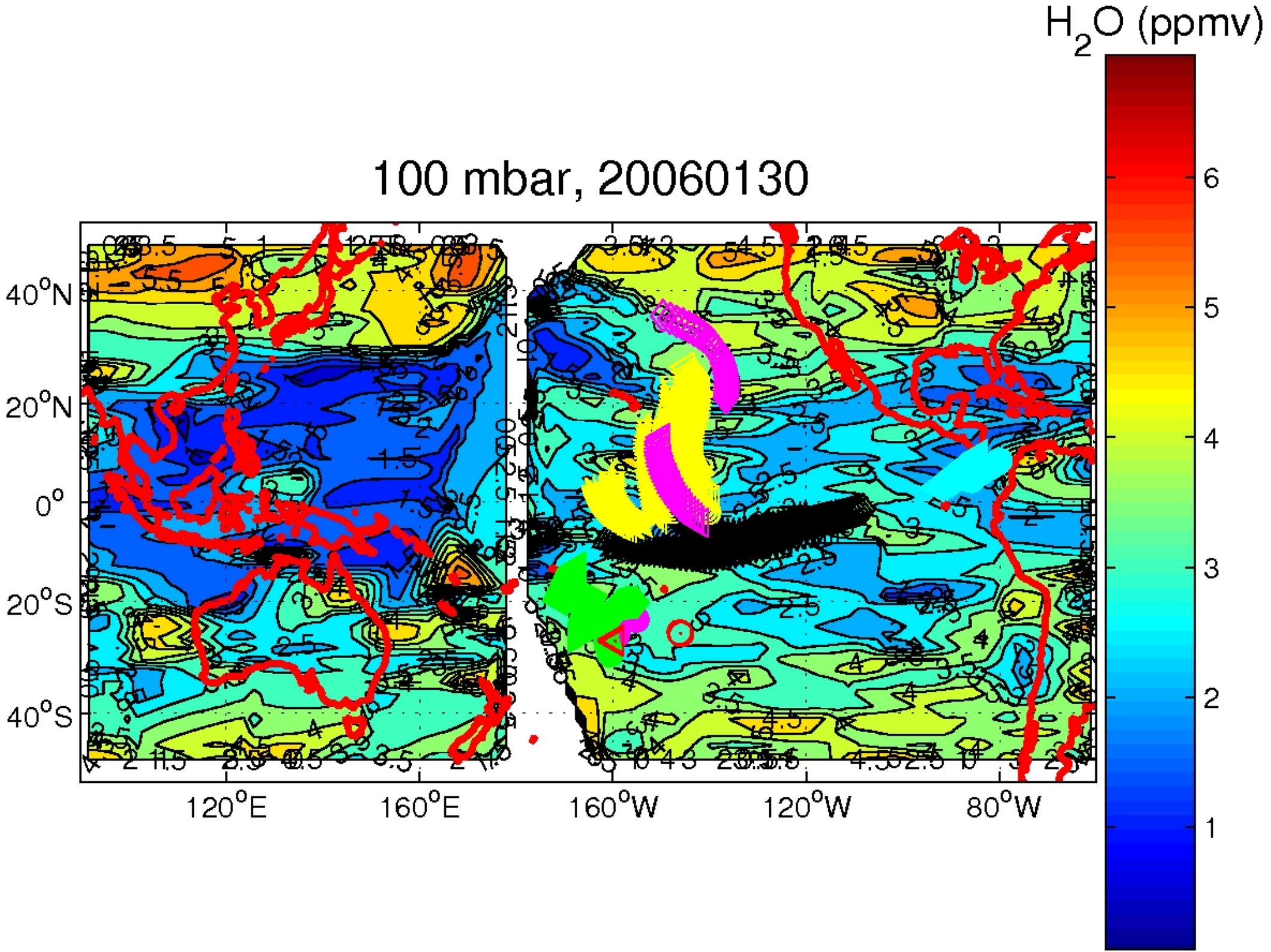

100 mbar, 20060128
H2O
(ppmv)
40°N
20°N
0°
20°S
40°S
120°E
160°E
160°W
120°W
80°W
6
5
4
3
2
1

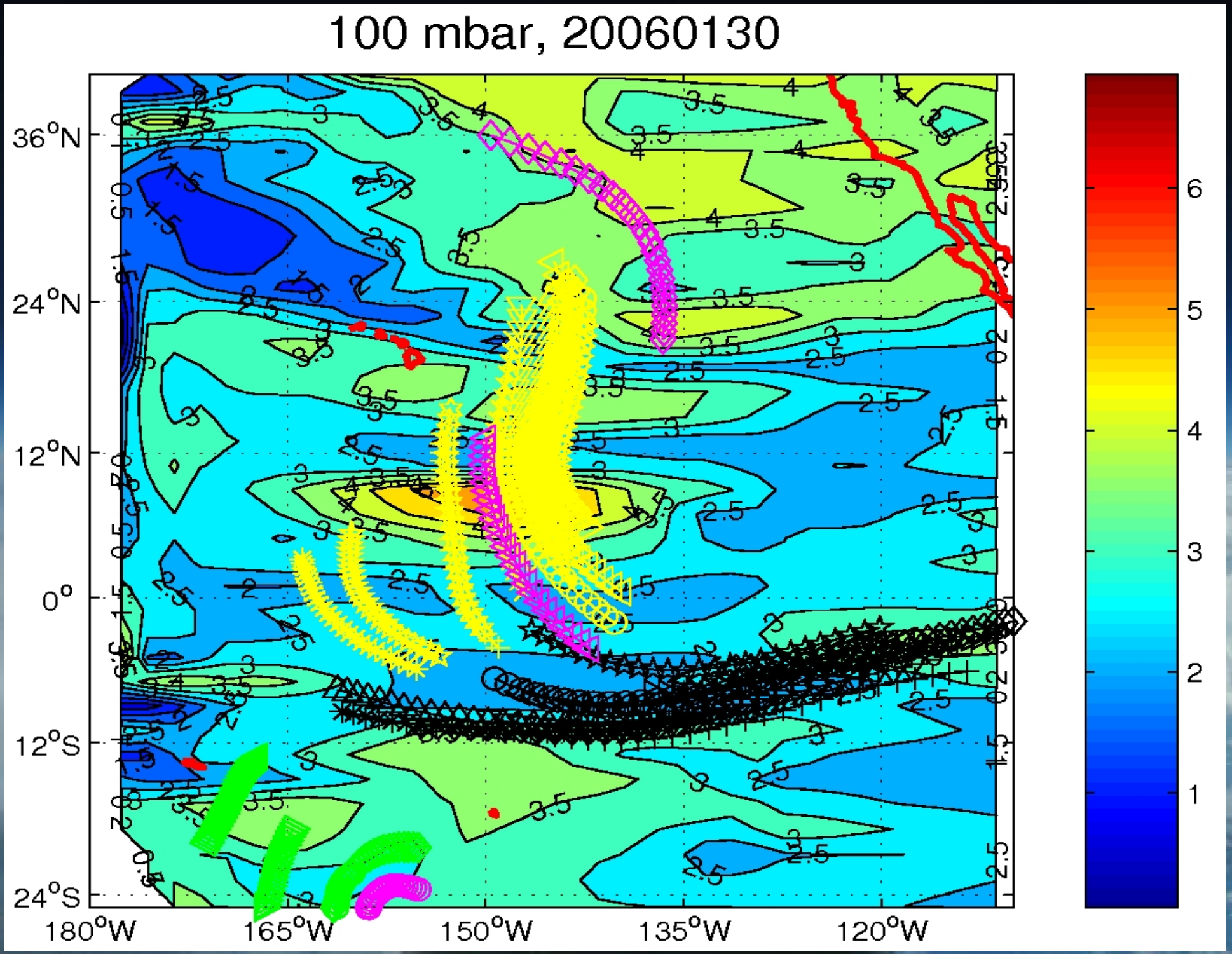

100 mbar, 20060128
H_2O
(ppmv)
6
5
4
3
2
1
40°N
20°N
0°
20°S
40°S
120°E
160°E
160°W
120°W
80°W

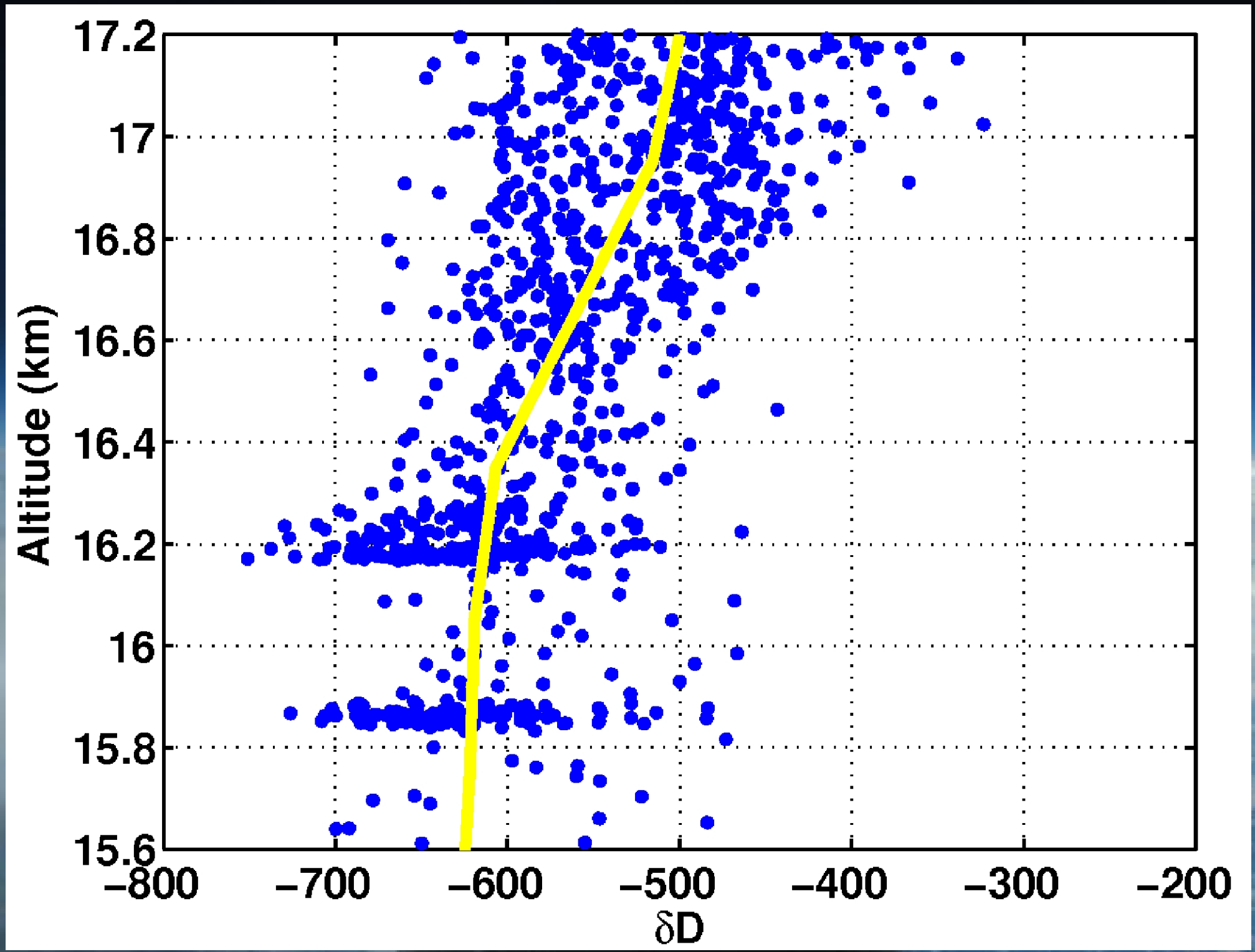

100 mbar, 20060128
H2O (ppmv)
36°N
24°N
12°N
0°
12°S
24°S
180°W
165°W
150°W
135°W
120°W
6
5
4
3
2
1

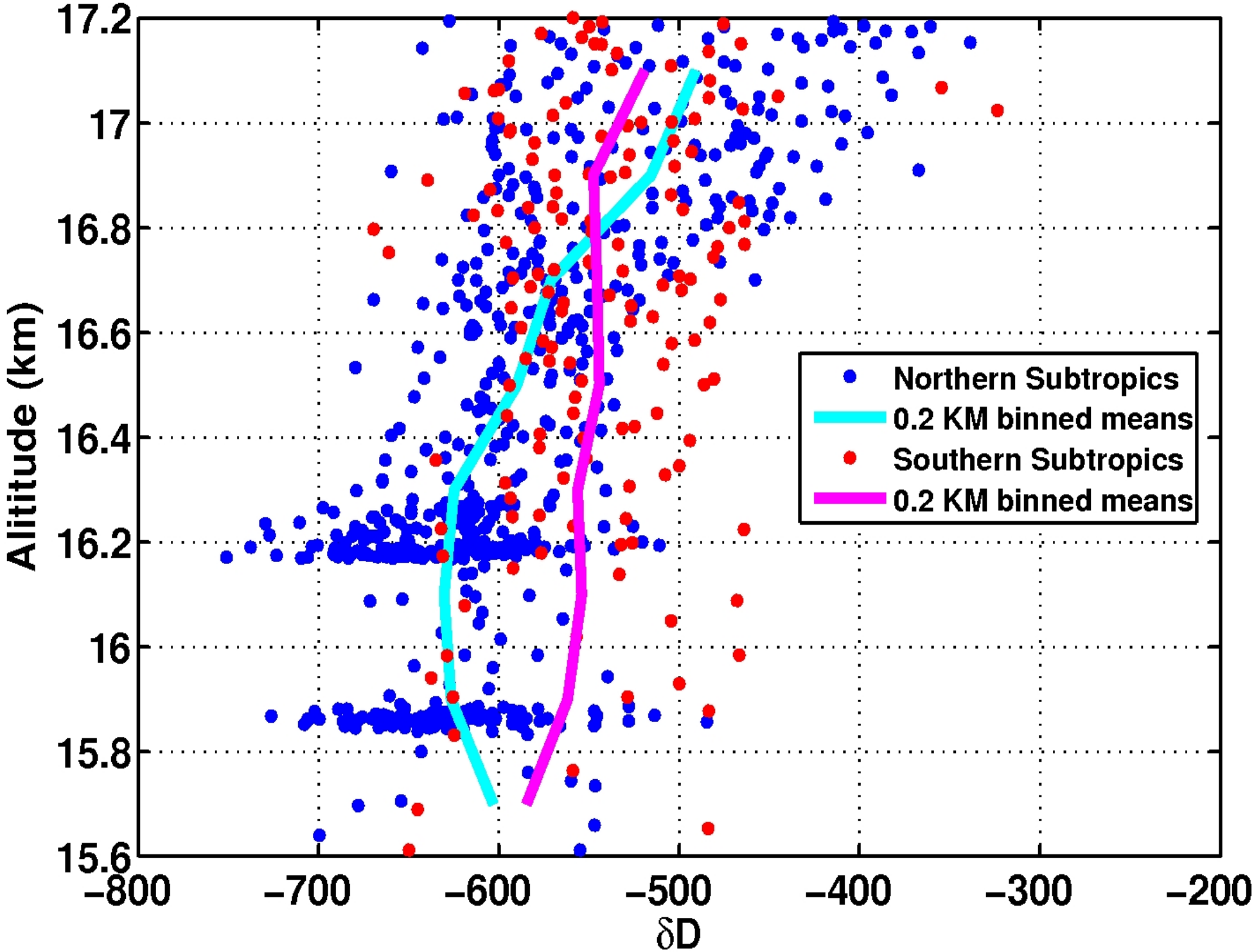

H2O (ppmv)
100 mbar, 20060129
40°N
20°N
0°
20°S
40°S
120°E
160°E
160°W
120°W
80°W
6
5
4
3
2
1


100 mbar, 20060129
H2O (ppmv)
36°N
24°N
12°N
0°
12°S
24°S
168°W
156°W
144°W
132°W
120°W
6
5
4
3
2
1


100 mbar, 20060130
H2O (ppmv)
6
5
4
3
2
1
40°N
20°N
0°
20°S
40°S
120°E
160°E
160°W
120°W
80°W


100 mbar, 20060130
36°N
24°N
12°N
0°
12°S
24°S
180°W
165°W
150°W
135°W
120°W
6
5
4
3
2
1


17.2
17
16.8
16.6
16.4
16.2
16
15.8
15.6
Altitude (km)
−800
−700
−600
−500
−400
−300
−200
δD


17.2
17
16.8
16.6
16.4
16.2
16
15.8
15.6
Alititude (km)
−800
−700
−600
−500
−400
−300
−200
δD
Northern Subtropics
0.2 KM binned means
Southern Subtropics
0.2 KM binned means

Origin of Air Sampled During CR-AVE

		North # (%)	South # (%)
Total		25 (64%)	14 (36%)
Convective	10 day	20 (80%)	14 (100%)
	5 day	18 (72%)	8 (57%)
Non-Convective		5 (20%)	0 (0%)

Summary

- No isotopic evidence for *in situ* dehydration
- Using MLS, almost all air sampled in the upper TTL during CR-AVE is influenced by convection
- Air from Southern Hemisphere (Summer) isotopically heavier than Northern Hemisphere

Future Work

- Extend analysis to first half of CR-AVE
- Extend analysis to other pressure levels
- Use MLS O3 and CO to characterize convection
- Look for an update at Fall AGU meeting