OCO-2 v8a versus v7b:

Improvement in retrievals over high-latitudes

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OCO-2 Algorithm Team, ORCAS Team, ABoVE Team

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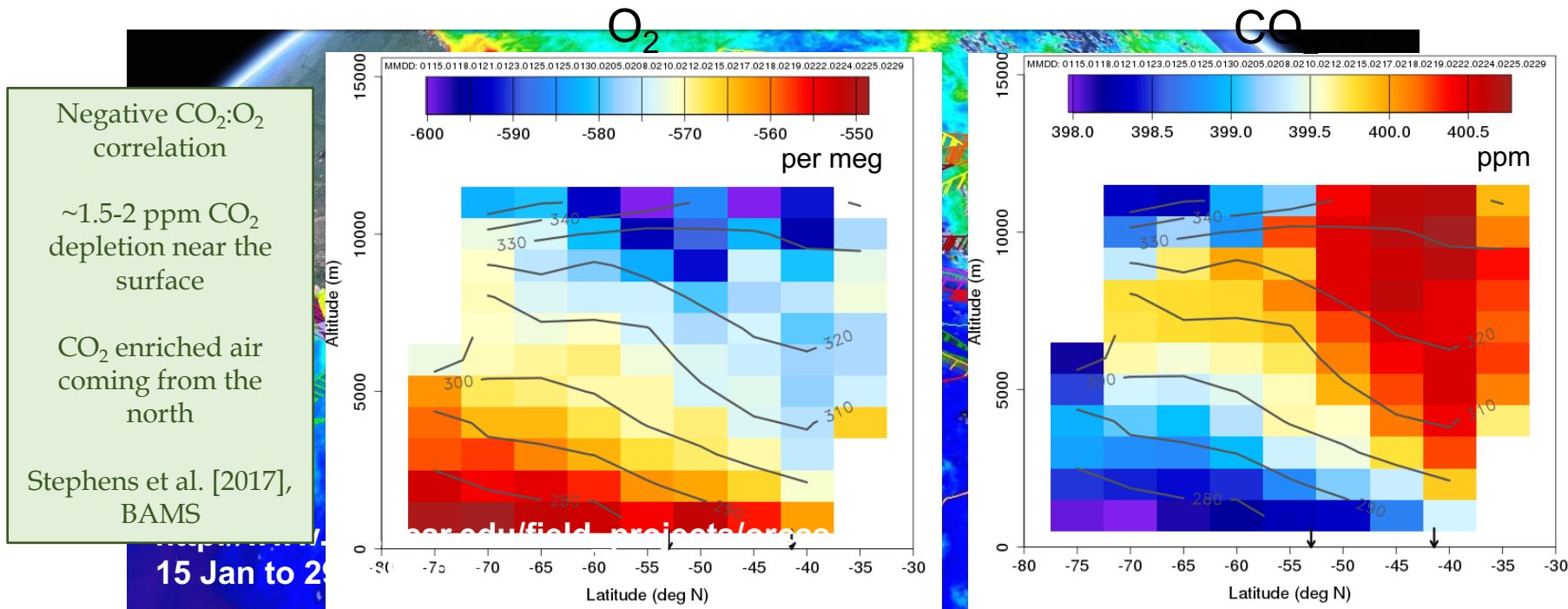
3 National Center for Atmospheric Research, US   4 Colorado State University, US

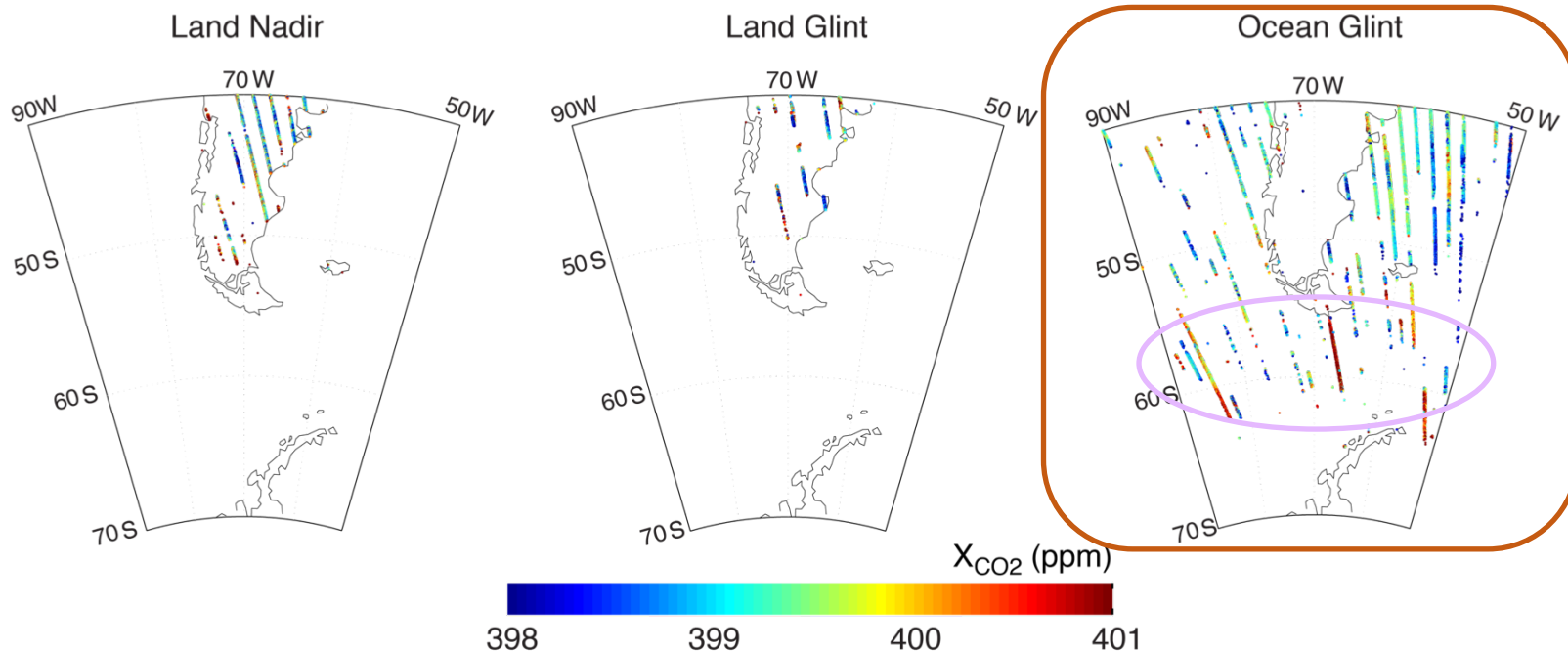**OCO-2 Science Team   Boulder, CO   25 October 2017**

Background

- ❑ v8 has more data, especially ocean retrievals at high-latitudes
- ❑ How do v8a and v7b retrievals perform against data collected during ORCAS?

O_2

CO_2

Negative CO_2:O_2 correlation

~1.5-2 ppm CO_2 depletion near the surface

CO_2 enriched air coming from the north

Stephens et al. [2017], BAMS

OCO-2 coverage during ORCAS

January 12 - February 29, 2016
(OCO2 v7B QF = 'good')

v7b

Land Nadir

Land Glint

Ocean Glint

X_{CO2} (ppm)
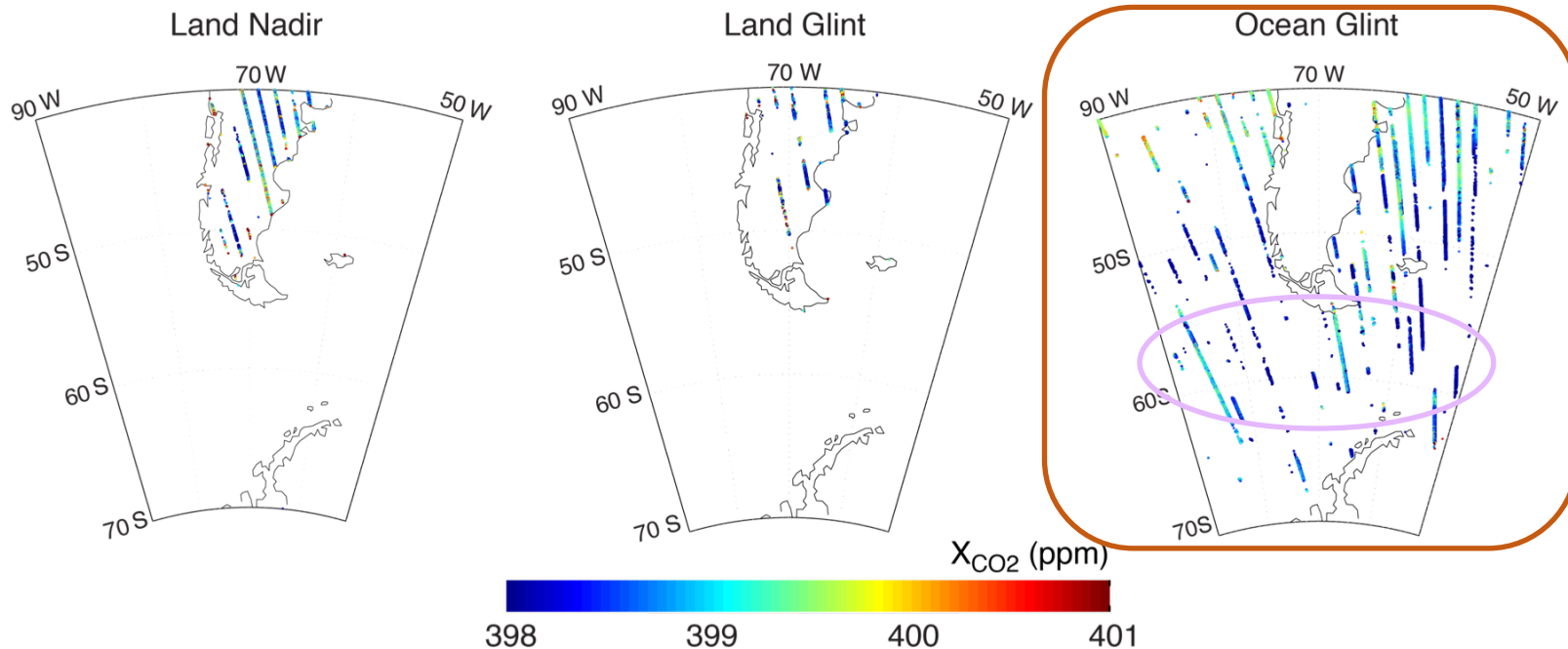
398   399   400   401

7 cases when OCO-2 passes coincided with ORCAS flights
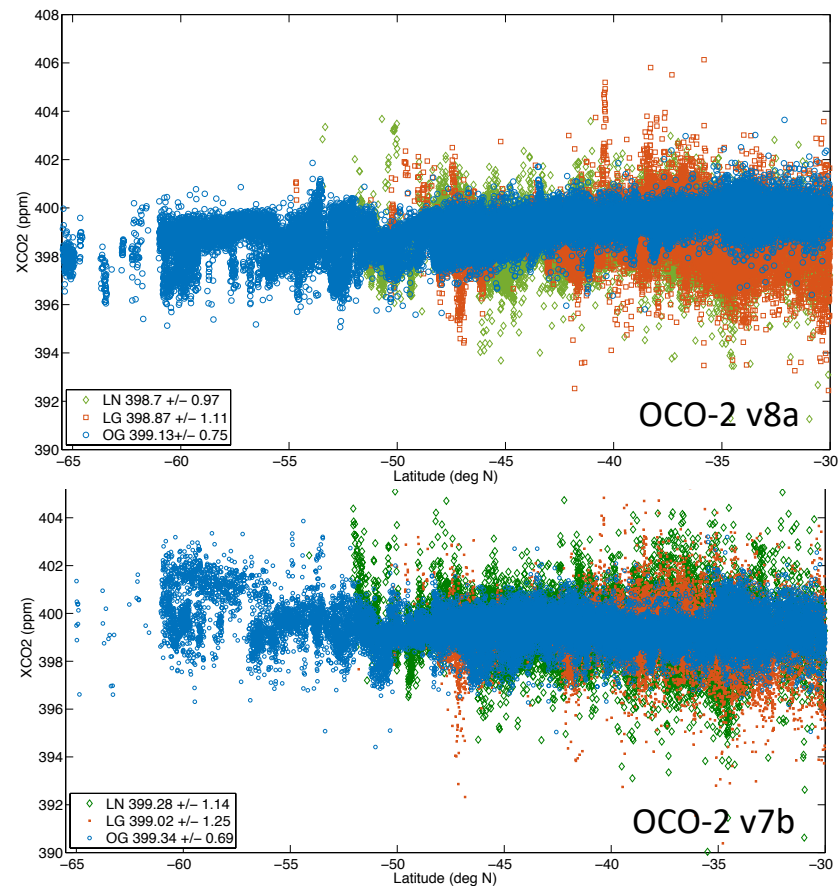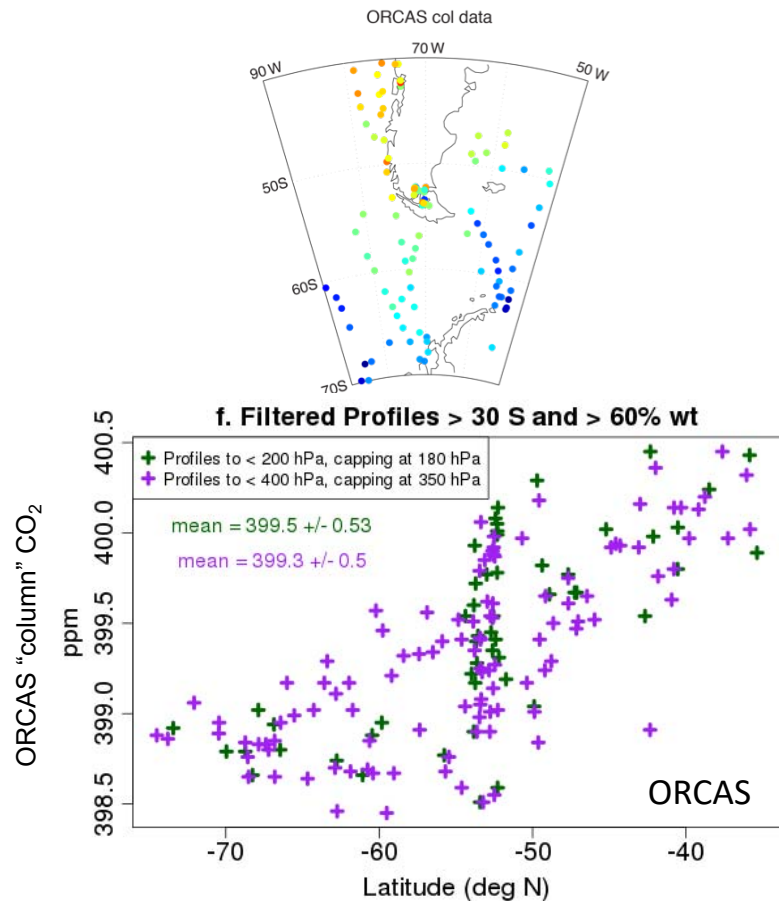
OCO-2 coverage during ORCAS

January 12 - February 29, 2016
(OCO2 v8A QF = 'good')

v8a

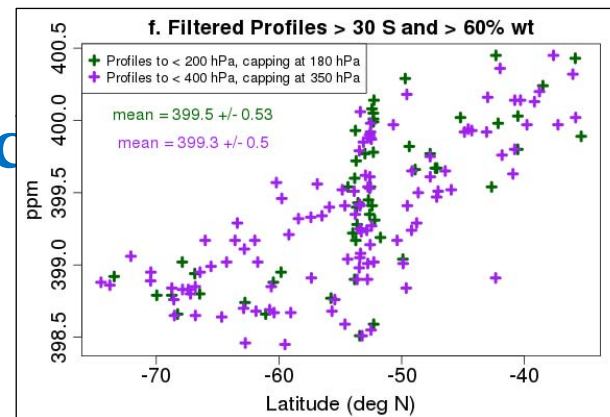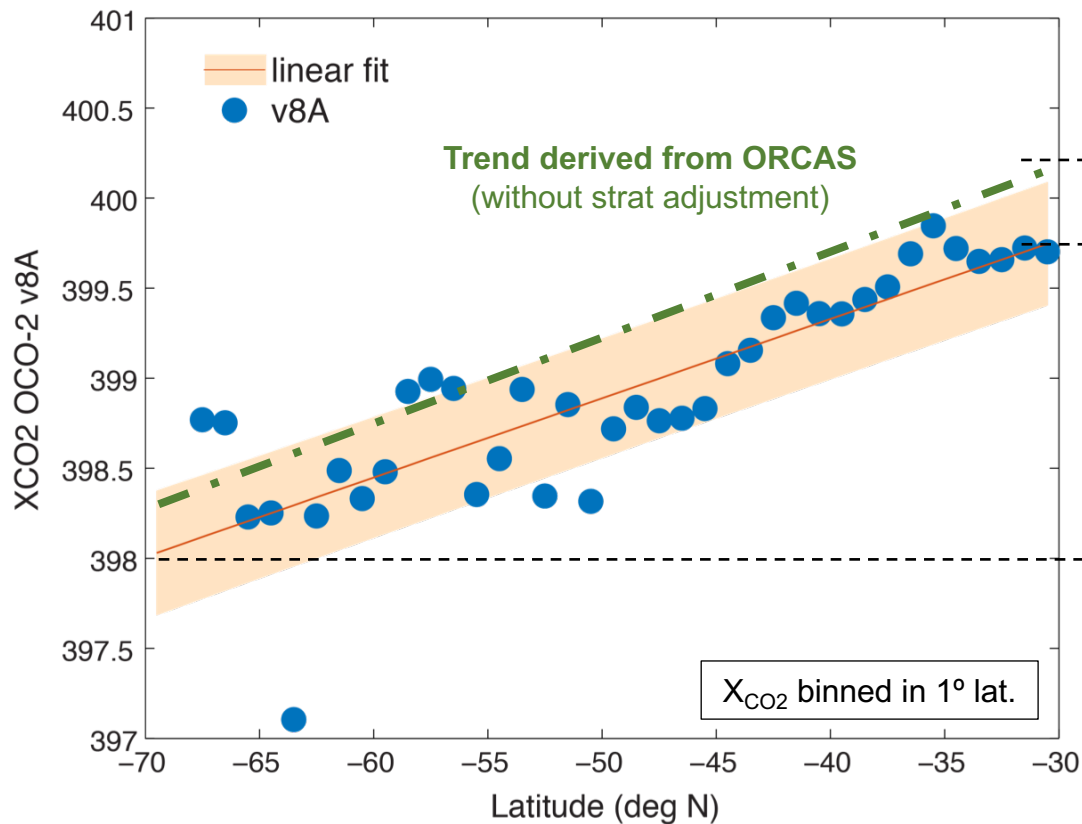
7 cases when OCO-2 passes coincided with ORCAS flights

OCO-2 ORCAS (domain wide trends)

OCO-2 ORCAS (domain wide

f. Filtered Profiles > 30 S and > 60% wt

+ Profiles to < 200 hPa, capping at 180 hPa
+ Profiles to < 400 hPa, capping at 350 hPa

mean = 399.5 +/- 0.53
mean = 399.3 +/- 0.5

Trend derived from ORCAS
(without strat adjustment)

0.3 - 0.55 ppm

1.71 ppm gradient between 30-70S

ORCAS observes ~1.9-2 ppm

X_{CO2} binned in 1° lat.

OCO-2 v8 & v7: high-latitude ocean retrievals

Takeaway

(given the first real opp. for validation of high-latitude retrievals…)

❑ v8a has higher SNR than v7b

❑ Combination of factors contributed – improvements in prescreening cloud filtering, inclusion of strat. aerosols, changes in bias correction algorithm, likely other factors

❑ v8a picks a N-S gradient similar to ORCAS column data

- this is extremely PROMISING!

Next Steps

❑ Are there residual biases in v8a?

❑ Will regular v8a (without bias correction) perform worse?

❑ How robust are the trends in X_{CO2} (assessment of individual RFs)?
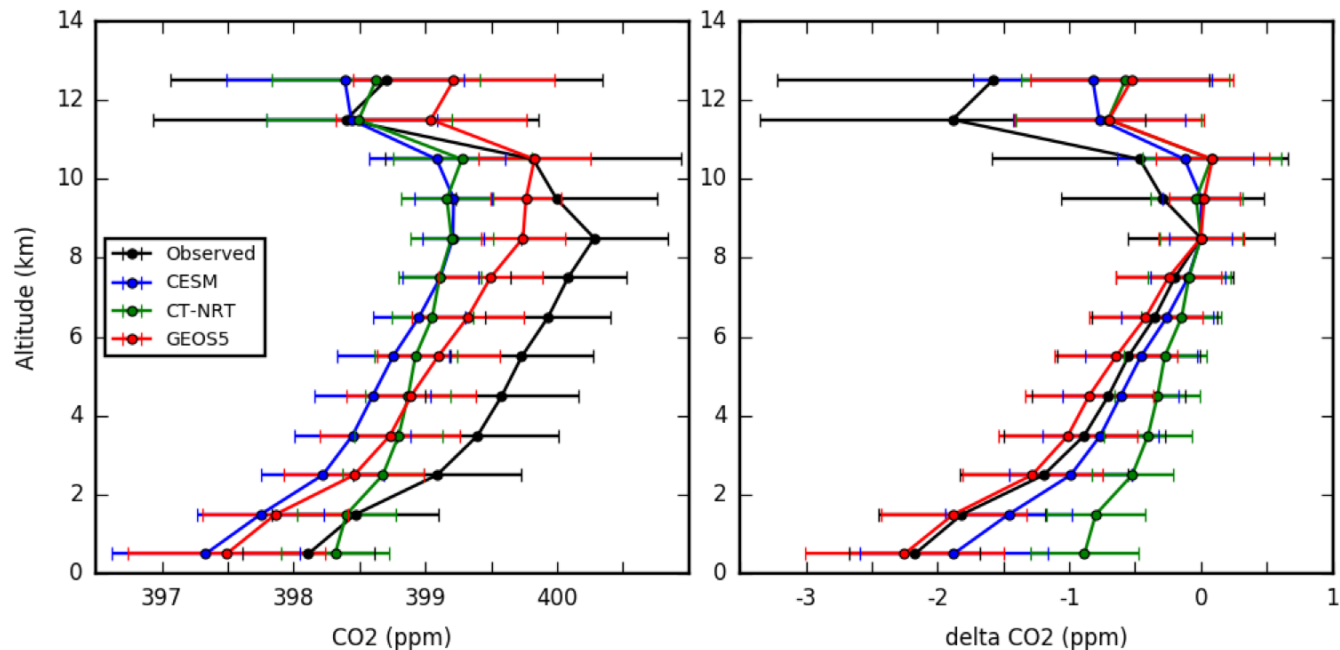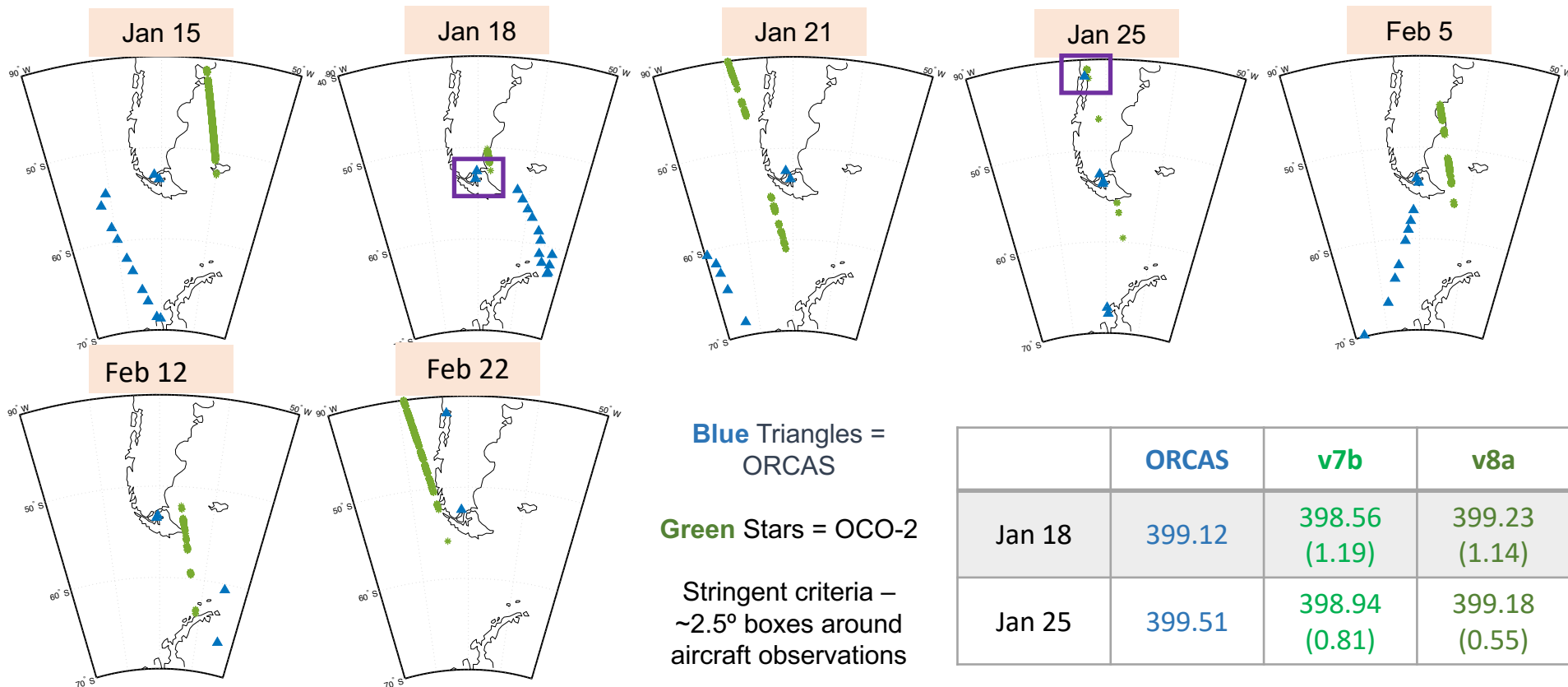
QUESTIONS?

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Global Models vs. ORCAS

Kathryn McKain et al.

❑ ORCAS-Model comparisons show varying levels of agreement - due to errors in ocean fluxes vs. errors due to incorrect vertical mixing (transport)

OCO-2 ORCAS (RF assessments)

Blue Triangles = ORCAS

Green Stars = OCO-2

Stringent criteria – ~2.5º boxes around aircraft observations

	ORCAS	v7b	v8a
Jan 18	399.12	398.56 (1.19)	399.23 (1.14)
Jan 25	399.51	398.94 (0.81)	399.18 (0.55)