

## Flight Report 20180503 Fiji to Christchurch

1 hour delay (air data computer reset)  
TO 20:58 UTC

Beautiful clear weather

Possible strat air at 10kft. , but it had extra CO ... and it was a doggie dish (aka rabbit ears) pattern. Likely some early indication of BB with higher O<sub>3</sub> than we often see.

Bigger than normal MBL Q gave us some bounces on dip 1.i; overall fairly strong winds down low.

**Theme of highly dispersed, ubiquitous pollution from Asia and Australia, in the SH middle and (often) upper troposphere.** The pollution we are seeing in the mid troposphere was forecast well: from Asia, cleaned of particles, etc. Surprised at how much O<sub>3</sub>. but it is FF not BB so maybe not a surprise. The flight track intercepts the highly diluted, aged edge of the intense river of pollution seen in the chem forecast, which emerges from Asia/Australia and hangs off to the W of the S Island. \*\* WE could actually see this stuff in the sunset at Fiji -- a very high scattering layer !!

Seeing modest BC and SO<sub>2</sub> in the pollution layer on dip 2. **CO is significantly inverted**, and there is a layer that is a bit thinner and more intense than in the forecast.

Dip 4 starts to see the forecasted pollution down low also, CO not as low and benzene elevated (not toluene)

Dip 4, cloud bottoms at 700m. Very dry lower troposphere.

Dip 4, CO<sub>2</sub>, CH<sub>4</sub>, and CO co-vary and inverted.; now we see CO higher, at the bottom. As in the forecast. Also Asian. **Significant excess NOy in this pollution.**

Dip 5. Cloudy, grungy; very high BC, CO elevation in the MBL. As predicted.

**Dip 6. Really filthy. 80 ppb CO, BC > 25, lots of SO2 above the cloud none below. Solid cloud deck as forecast.**

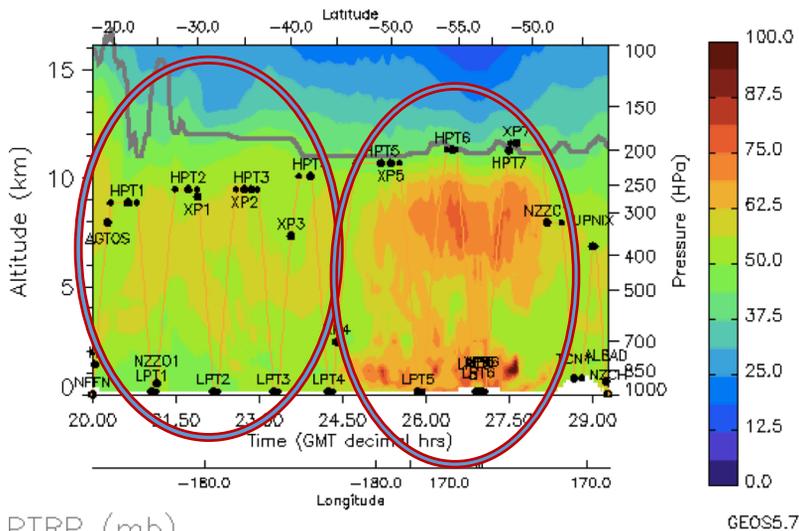
**This dip shows an iconic vertical profile -- plus a very sharp SO<sub>2</sub> doggie dish, CO over 95.O<sub>3</sub>, NOy doggie dishes. thick cloud. HCHO, Benzene, Toluene, all very high along with . Nothing for CH<sub>3</sub>CN. The CO profile is shown from the ChemWAD feed below.**

**Rabbit ears with very high NOy and SO<sub>2</sub>, nothing for CO: Coal, or ship plumes.**

**THIS LARGE SCALE POLLUTION OF THE SH IS A CLASSIC picture for ATom-- also saw high alt SH Pacific pollution in ATom3 and ATom2.**

High point 7 turbulence, (jet crossing at 38k). Stratosphere 150 ppb O<sub>3</sub>.

**TCCON/Lauder.** Good viewing for TCCON. We saw flat profiles. From 39 kft, got 2000 ft of strat ; There was a very thin PBL, with CO<sub>2</sub> drawdown to 402 ppm, the rest of the profile was a gradual decline from 406 -> 405 39 kft -> just above the PBL. Probably our best cal run ever over Lauder.



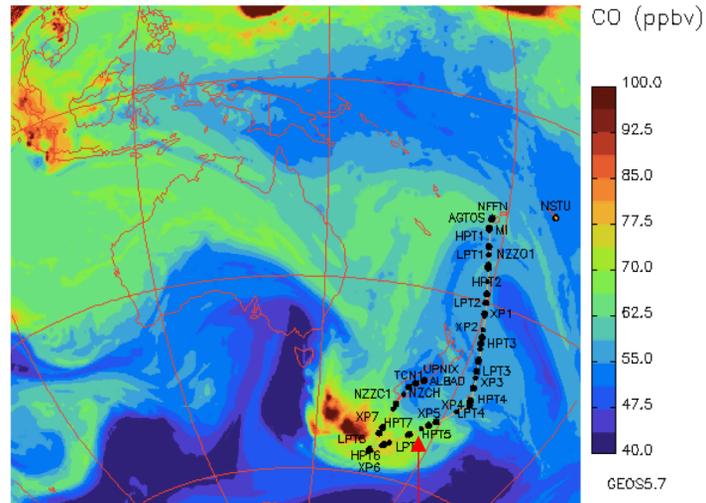
**CO curtain**  
 Fiji → Christchurch  
 Low but measurable pollution (Fossil Fuel) forecast for the middle troposphere, higher amounts lower and middle E of New Zealand.

PTRP (mb)

CO (ppbv)

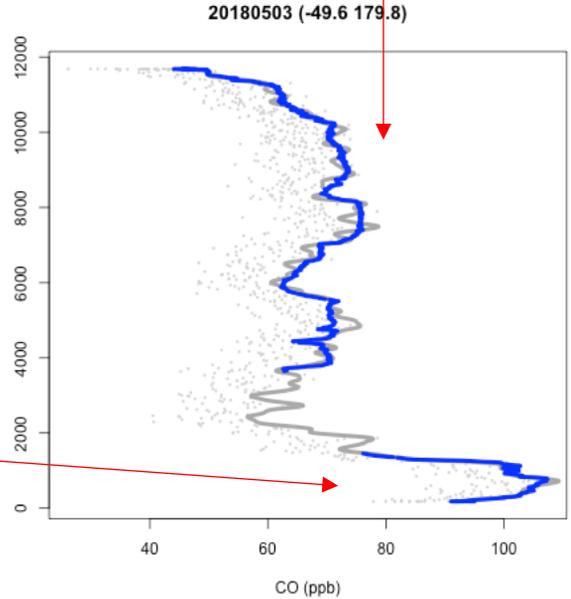
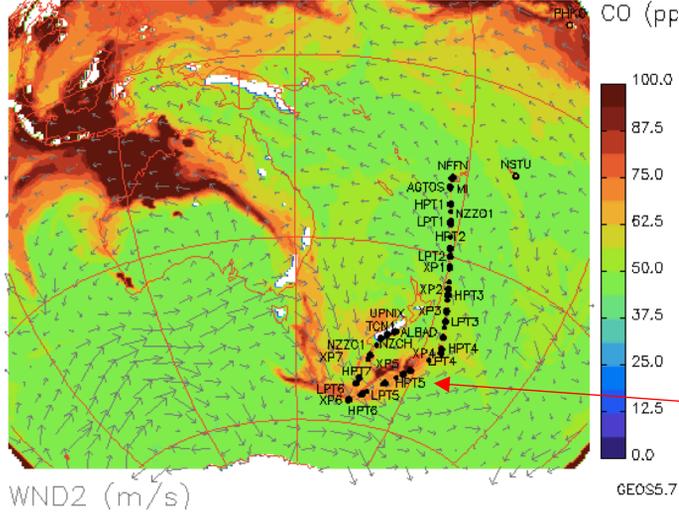
**300 mb**

Very widespread pollution (Fossil Fuel) was forecast at 300 mb, and likewise a large, more intense filament at 900 mb. Sources appear to be in SE Asia aloft and both Asia and Australia low down.  
*These signals were actually observed in the flight.*



**900 mb**

2018-05-04T01:00 UTC (66-hr fcst) at 900.0





Fiji Coast



Windy Boundary Layer, 34 S



Stratus Imaging an Island's Bow Wave



Strong, low level pollution was observed below the stratus deck E of New Zealand. Areas with thin laminae of  $\text{SO}_2$  and  $\text{NO}_y$  (ship sources?) were seen just above the clouds several times.



New Zealand highlands in autumn



Overflight of Lauder TCCON

Photo: B. C. Daube