

Response to Referee 2

1. *It would be useful for the reader if the dimensions, weight and power requirements of the RIM-ICOS was provided, as it's deployment on a balloon suggests it could also be applicable to other platforms with payload constraints.*

1.1 Response to Referee: Thank you for this suggestion. We've updated the manuscript accordingly.

1.2 Changes to Manuscript: On page 9/lines 280-282, the following text has been added:
"The dimensions of the pressure vessel are 1.2 m in length and 0.3 m in diameter. The two pumps were housed in a separate box with dimensions of 27 cm x 41 cm x 16 cm. The HCl instrument platform requires 590 W when operating and weighs 68 kg."

2. *The authors state that the instrument inlet and measurement cell are held at a temperature of 310 K in order to reduce temperature-related changes to the HCl spectra being fitted and also minimise surface effects from both HCl and water. One possible consequence of this heating is that sampled HCl in the particle or ice phase could repartition into the gas phase under these warmer temperatures. This potential interference has been discussed previously for both stratospheric and tropospheric HCl observations (e.g., Webster et al. 1994 & Crisp et al. 2014). The authors should discuss the potential impact of this repartitioning of HCl on their measurements.*

2.1 Response to Referee: Thank you for this interesting point. First, we'll unpack the issues brought up in Webster et al., 1994. They reported on in situ stratospheric measurements in the Arctic, which is more related to our campaign environment than the measurements made in Crisp et al., 2014. Webster et al. report on measurements of HCl, N₂O, CH₄, NO₂, and HNO₃. They discuss thermal re-partitioning of HNO₃ when aerosols vaporize upon being heated by the instrument. The concern is that the instrument's gas phase HNO₃ measurement may be off because some of the HNO₃ in the aerosols will enter gas phase as the aerosols vaporize. They discuss only HNO₃ in this context because stratospheric aerosols associated with polar stratospheric clouds are commonly nucleated by HNO₃, meaning its concentration in a typical aerosol in this environment will be significantly higher than other gas-phase stratospheric species. Even so, Webster finds the error would amount to 1% for 1-micron-diameter particles. Outside the Arctic, stratospheric aerosols are also often nucleated by H₂SO₄. HCl, however, is not a significant stratospheric nucleation source. Furthermore, Webster does not discuss any errors in their stratospheric HCl measurements arising from thermal re-partitioning or from any other issue related to heating the instrument. Crisp et al. does explicitly discuss error associated with increasing gas-phase HCl from vaporizing aerosols from heating. Their measurements entail heating the inlet to 308 K, around the same temperature to which our instrument was heated during flight. However, they are measuring tropospheric air near the ocean. The environment they measure therefore has notably different aerosols than what is encountered in the stratosphere—specifically ones formed from sea spray. As such, their observed aerosols are rich in Cl⁻ from the sea salt. Crisp et al. are specifically trying to "assess the impact of HCl volatilization from *chloride-containing* particles" (Crisp et al., Section 2.2). The potential for error in these tropospheric HCl measurements is analogous to the HNO₃ measurements in the stratosphere discussed in Webster et al., 1994. Again, stratospheric aerosols are not known to be rich in chloride.

This comment by Referee 2 is certainly important to consider when making in situ atmospheric measurements, and we thank them for bringing it up. However, the referee's comment applies more to H_2SO_4 or HNO_3 in the stratosphere or HCl in the troposphere, especially near bodies of saline water. We do not feel it applies to stratospheric observations of HCl made by our instrument.

2.2 Changes to Manuscript: None