

Review report

Journal : AMT

MS No. : amt-2018-300

Title : **The Macquarie Island [LoFlo2G] high-precision continuous atmospheric carbon dioxide record**

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The authors report on high-precision continuous measurements of carbon dioxide (CO₂) in the framework of the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The measurements were performed at Macquarie Island in the Southern Ocean region using a LoFlo2 instrument based on non dispersive infrared (NDIR) method. A detailed discussion is given on protocols of measurements and calibration, analysis of measurement uncertainty sources and procedures for baseline determination.

General comments

The manuscript is well structured and written, scientifically sound. It would be acceptable for publication in AMT after minor revision by addressing the comments and questions listed below.

Specific comments

(1) Page 14, section 5 "Defining a baseline record" : the authors discussed how to remove influences of local flux and Southern Hemisphere land flux to achieve a regional background CO₂ observation. Should be considered the ocean-atmosphere CO₂ exchange in this case? If yes, how to take into account such influence?

(2) Page 16, section 5.3 "Curve fitting" : a low-pass filter is used to fit the hourly CO₂ data to smooth the time-series results. Is the Kalman filtering method more suitable for such application? As an adaptive filtering technique, Kalman filter can efficiently remove the shot-to-shot variability related to the real-time noise in the measured data with minimal deformation of the physical quantity to be measured. Kalman filtering method has been successfully applied to perform fast and high-precision measurements of trace gas concentration [*Appl. Phys. B* **74** (2002) 85-93] and isotope ratio [*Opt. Lett.* **35** (2010) 634–636].

Technical corrections

(1) Page 6, line 8 and line 28 : "Fig. 2e" should be "Fig. 2f"?

(2) Please make larger the following figures 2, 4, 6 and 7.

(3) Some sentences are too long. It would be better to rephrase them and to make them more understandable. For instance,

Page 2, lines 27-30 : "While the performance to reduced calibration requirements";

Page 5, lines 24-26 : "Macquarie Island sample measurements";

Page 8, lines 24-26 : "This is independent in a calibration run)";

Page 10, lines 2-4 : "The uncertainty 18 reference standards";

Page 15, lines 21-23 : "Radon is input and zero poleward of 70°";

Page 15, lines 27-29 : "Radon selection for radon of 20 mBqSCM-1";

Page 17, lines 21-23 : "Tropical and northern Frederiksen, 2016)";

Page 18, lines 7-9 : "The in-situ by multiple orders of magnitude";

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