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Atmospheric Measurement Techniques Discussions

Interactive comment on "Application of an O-ring pinch device as a constant pressure inlet (CPI) for airborne sampling" *by* Sergej Molleker et al.

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Overall Comments

A novel, variable-diameter orifice inlet is described that facilitates the operation of airborne instruments requiring a constant inlet operating pressure. This is a useful work presenting a creative idea for actively pinching an Oring to create the variable orifice. Particle transmission efficiency study results validate successful operation of the new device.

I believe cloud condensation nucleus instruments also typically employ a constant pressure inlet for aircraft measurements. I suggest adding a sentence to the introduction referring to this application as it could benefit many readers.

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Discussion paper

Specific Comments

I have some concerns regarding the reproducibility of the circularity of the orifice diameter and how this might impact the particle transmission efficiency. The photos in Figure 5 are extremely useful toward understanding the behavior of the orifice diameter as a function of pinch. In Fig 5b the top 4 panels still appear to show non-circular orifice diameters. Please add a short discussion of the reproducibility of the transmission efficiency results for the same oring as well as after a new oring has been installed in the device.

Other technical questions that do not necessarily need to be addressed in the paper but would be interesting to understand include: expected lifetime of the oring, scheduled cleaning required due to collection of particles, ablation of oring material creating "rubber burrs" or altering the orifice circularity, oring fatigue due to constant pinching, and ozone exposure degrading the oring elasticity.

Technical Corrections

Page 2 line 7 I suggest changing to ". . .without additional pumping or bypass flow. . ."

Page 2 line 25 change to "The shape of the pinched orifice is critical toward avoiding significant. . ."

Page 2 line 36 do you mean 3.9 mm?

Page 2 line 45 is the range of the pressure sensor really only 0-10 hPa?

Page 2 line 49 can you comment on whether a +/-2% pressure deviation influences the flow enough that the transmission efficiency is affected?

Page 3 line 8-10 I suggest: "The pinching movement travel is limited by two optical sensors. One sensor prevents overloading the motor at maximum pinching while the second sensor prevents the mechanism from opening too far, which. . ."

Page 3 line 39 I suggest: "Laboratory tests with the 0.5mm Oring were performed prior

to field deployment during stratospheric flights. . .."

Page 3 line 45 Would a more straight forward way to measure the transmission efficiency have been to operate an OPC/other particle detection instrument downstream of the aerodynamic lens while a similar instrument was measuring the particles entering the CPI/aerodynamic lens?

Page 4 Eqn 2 I believe particle diameter is supposed to be squared in the Stokes number relation.

Please review and rewrite the transmission efficiency test description at the bottom of page 4 and top of page 5 to make it clearer.

Page 5 line 50 "Nevertheless, even at the lowest inlet pressure of 65. . .."

Please rewrite the top paragraph of page 6 to make it clearer.

Figure 1. Constant is spelled "Constatn" in the box in the figure

Figure 2. I would restate in the caption that the oring dimension 0.4x2.15 mm is Inner Diameter x Cross Section.

Figure 4. The caption: ". . .which differ in dynamic pressure" do you mean ". . .which differ by the dynamic pressure"?

Figure 8 I suggest making the fixed orifice results with a solid black line to make it easier to distinguish from the other curves. Why do the two lowest pressure curves shows an increase in TE at the largest particle sizes? Choose a different color for either the 125 hPa or 65 hPa results so they are easier to distinguish from each other.

Figure 9 caption: should it be: "Transmission of PSL particles through the CPI device and an aerodynamic lens as a function of. . ."

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