

Interactive comment on “Continuous measurements of atmospheric water vapour isotopes in Western Siberia (Kourovka)” by V. Bastrikov et al.

Anonymous Referee #1

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The paper represents an extensive performance of the Picarro Wavelength-Scanned Cavity Ring Down Spectroscopy (WS-CRDS) analyzer coupled with calibration system (Standard Delivery Module). Recently, commercially available isotope analyzer becomes popular for water vapor isotope monitoring in various field sites, however its application in cold region is still rare. The authors have carried out long-term monitoring over a year in cold region and showed good quality data through applying drift correction, slope calibration, and H₂O concentration dependences. In particular, the finding that “dry air” is required to obtain accurate humidity-isotope response function using the SDM is good information for scientist who is using Picarro. The manuscript

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is well written and structured. Specific comments and suggestions are listed in below.

Page 476, line 26: This sentence should be divided clearly into surface processes and atmospheric processes. And, should choose reference more carefully. Here I describe my suggestion: As a result, fractionation takes place during each phase change such as evaporation from the sea surface (Craig and Gordon, 1965; Merlival and Jouzel, 1979), soil evaporation and plant transpiration from land surface (Farquhar et al., 2007), condensation in the clouds (Jouzel, 1986; Ciais and Jouzel, 1994) and rain re-evaporation and diffusive exchange processes between raindrop and vapor (Stewart, 1975; Field et al., 2010).

Page 477, line 11: Dansggard, 1964 should refer in here. (Dansgaard, 1964; Rozanski et al., 1993; Gat, 1996) . . .

Page 477, line18: LGR instrument is based on off-axis integrated cavity output spectroscopy system (OA-ICOS) technique. Please describe more precisely.

Page 478, line 1-4: Water vapor isotope monitoring using laser technique has also been carried out in Asia (e.g., Wen et al., 2011; Kurita et al., 2013).

Page 480, line 16: Please describe the range of room temperature precisely with plus and minus symbol (e.g. 18±0.5 degree C).

Page 480, line17: “~” -> about

Page 480, line 21: Please describe temperature range more precisely. Do not use “~”, but note exact temperature range.

Page 480, line 27: I don't understand this sentence. Water vapor directly injected into the Picarro? Is the following my interpretation correct? “Each reference water is injected into heated chamber in the vaporizer which set at 140 degree C and then mixed with dried room-air pumped through a DRIERITE column.”

Page 481, line 19 – 23: Please start with a CAPITAL letter.

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Page 482, line 1-15: Please start with a CAPITAL letter.

Page 482, line 19-20: “Starting from June 2012” -> “From June 2012 to September 2012”

Page 482, line 24: Does calibration module mean the SDM? And, please clearly mention what parts the authors replaced. Is the following my interpretation correct? “In September 2012, the SDM was replaced to the latest system with new glass syringe; this led to . . .”

Page 483, line 5: results compare -> results were compared

Page 486, line 25: 3 percent is quite huge. Is this mean 3 permil?

Page 487, line 24-25: Please describe the grounds why the authors could judge as “significant”.

Page 487, line 26-29: I don’t understand this sentence. Do these slope values reflect the amplitude of continental recycling? If so, please explain the background process precisely.

Page 488, line 16: Rayleigh distillation theory is used to explain not the isotopic evolution in surface vapor, but in precipitation. Please reconsider this sentence.

Page 488, line 17-21: This discussion is based on the explanation for the temperature effect observed in isotopic content in precipitation. Air mass, which forms precipitation should not be identical with surface vapor. I think it is better to read Lee et al., (2006) before revising this manuscript.

Page 488, line 23: The word “probably” is too strong to use here. I think “maybe” is much better in this case.

Page 489, line 21-25: This explanation is not clear. I can’t understand why the difference in vegetation types on the surface lead to different pattern of the diurnal d-excess cycle. Generally, diurnal cycle is linked to the regional or local circulation, so that di-

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urnal cycle dominates over the region when large-scale circulation is weak. I guess that Cluster 1 and Cluster 2 can be characterized by each particular large-scale atmospheric pattern. How do you think?

Page 490, line 4: “is observed” -> “was observed”

Reference list

- 1) Jouzel, J., Isotopes in cloud physics: Multistep and multistage processes. The Terrestrial Environment B, P. Fritz and J.C. Fontes, Eds., Vol.2, Handbook of Environmental Isotopes Geochemistry, Elsevier, 61-112, 1986
- 2) Kurita, N., Y. Fujiyoshi, R. Wada, T. Nakayama, Y. Matsumi, T. Hiyama, and K. Muramoto, Isotopic variations associated with North-South displacement of the Baiu front, SOLA, 9, 187-190, 2013
- 3) Lee, X., and R. Smith, and J. Williams, Water vapor $^{18}\text{O}/^{16}\text{O}$ isotope ratio in surface air in New England, USA, Tellus, 58B, 293-304, 2006
- 4) Stewart, M.K., Stable isotope fractionation due to evaporation and isotopic exchanges of falling water drops: applications to atmospheric processes and evaporation of lakes, J. Geophys. Res., 80, 1133-1146, 1975
- 5) Wen, X-F. S-C. Zhang, X-M. Sun, G-R. Yu, and X. Lee, Water vapor and precipitation isotope ratios in Beijing, China, J. Geophys. Res., vol115, doi:10.1029/2009JD012408, 2011

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