

Interactive comment on “Multi-static spatial and angular studies of polar mesospheric summer echoes combining MAARSY and KAIRA” by Jorge L. Chau et al.

Anonymous Referee #2

Received and published: 25 April 2018

The authors present PMSE measurements obtained by a unique setup, a combination of vertical monostatic sender/receiver and a receiver tilted towards the primary system with 180 km baseline. They surprisingly observed PMSE above the middle point illuminated by the sidelobes of the primary system. With a valid assumption on PMSE altitude they were able to register the horizontal movement of PMSE structures. They observed drifting structures and the estimated horizontal scales correspond to scales known from NLC observations. The special setup allowed to constrain the lower limit of the angular sensitivity disproving that PMSE are highly aspect sensitive. The measurement results are carefully interpreted related to PMSE scattering theories.

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The paper is very well written and explained. Efforts were made to investigate this unique case study as comprehensive as possible. Clearly, the results of the drifting PMSE structures are intriguing, and corresponds well with the expectations derived from NLC observations. Because this is the first experimental evidence for horizontally drifting PMSE structures and it demonstrates the high potential of this kind of measurements, this work is of high scientific value and suitable for publication in ACP. I have only minor remarks, mostly language, which are listed below.

p. 1, l. 1: Noctilucent clouds -> noctilucent clouds

p. 1, l. 2: the 3 m Bragg wavelenth refers to PMSE only, not to NLC, this part could be reworded to make this clearer

p. 1, l. 6: have horizontal widths

p. 1, l. 15: over high (or polar) latitudes

p. 2, l. 10: you show later that the area illuminated is much wider than these mentioned few km

p. 2, l. 20: during special atmospheric conditions

p. 2, l. 20: special in what way?

p. 4, l. 7: 2.8 m

p. 4, l. 7: is Sc0 -> Sc?

p. 4, l. 8: fix -> fixed

p. 4, l. 21: delete for in "and for k_B "

p. 4, l. 32. thae -> the

p. 5, l. 1-2: these two sentences are not consistent. Either this configuration allows only one Bragg vector or multiple

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p. 5, l. 12: Could you explain more clearly about the horizontal width of the MAARSY reception beam, in relation to Fig. 3a? Does MAARSY also receive (a minor partition of) power from the side lobes above the middle point as well? And could MAARSY be configured to steer a single, localized reception beam towards the middle point? The horizontal extent using the imaging approach by Sommer and Chau (2016) is limited to ± 15 km, so maybe not.

p. 6, l. 12 “a horizontal distance” -> “horizontal distance with respect to middle point”

p. 6, l. 19: and its located -> and is located

p. 7, l. 27: an SNR -> a SNR

p. 8, l. 7: width -> widths

p. 8, l. 8: 290 -> 290 km

p. 8, l. 20: delete "also overhead MAARSY", it's mentioned before the brackets already

p. 8, l. 29: Taking into account

p. 8, l. 30 and label them as

p. 9, l. 6: we show the parameters

p. 10, l. 17: "with NLC structures as known from ..." Otherwise this sentence can be misunderstood as if you had these additional data for this date and location

p. 10, l. 23: "while MAARSY monostatic ..." please check grammar of this sentence

p. 10, l. 25: please add the citation here as well

p. 10, l. 26: can you provide an estimate of your limits?

p. 10, l. 32: structure -> structures

p. 11, l. 11: allows for measurements

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p. 11, l. 14: to observe

p. 12, l. 8: the obtained ratio profiles

p. 12, l. 34: In case of

p. 13, l.6: remove “in the viscous-convective subrange”, it’s double

p. 13, l. 9: delete double “their”

p. 13, l. 10: belongs to

p. 13, l. 10: reword “majority PMSE”

p. 13, l. 11: remove “that” in “we show that two”

p. 13, l. 11: “polar mesospheric echoes in the summer” -> PMSE

p. 13, l. 24: allows for the observations

p. 13, l. 25: would also allow

Fig. 3: (e) Distace -> Distance

Fig. 8: Caption: dot between “blue The expected”

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-210>, 2018.

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