

On the intrinsic time-scales of temporal variability in measurements of the surface solar radiation”  
by M. Bengulescu et al.

#### ANSWER to Tommaso Alberti

We thank Mr Tommaso Alberti for the review and encouraging comments.

COMMENT. *“I suggest to insert some explanations and discussions about the boundary effect problem and on the stopping criteria for the sifting process (pag. 5, Section 3.1.1). I think the adopted ones should be indicated.”*

ANSWER. Section 3.1.1 has been amended to take into account this comment by discussing both the boundary effect problem and the stopping criteria.

COMMENT. *“Some additional descriptions on time variations observed in Figure 5 (bottom panel) could be very useful or, alternatively, a plot of the instantaneous frequency could be added to better show its time variations, also to visually facilitate the reader (pag. 7, line 5).”*

ANSWER. A plot of the instantaneous frequency was added in fig. 5.

COMMENT. *“I think that the null-hypothesis test proposed in Section 3.2 is a simple but powerful test to investigate the noise-like existence of IMFs. If I do not misunderstand, this is particularly suitable when the EMD really acts as a dyadic filter. I suggest to remark this also when you describe Figure 7 in which a “dyadic” behavior can be observed for the high-frequency modes.”*

ANSWER. This was already mentioned w.r.t. the shapes of the Fourier spectra in figure 4. It is now done also w.r.t. figure 7.

COMMENT. *“The results discussed in Section 5.4 are really important in the framework of weather and climate systems study. Also a cross-phase analysis could be useful to support these findings (not only related to the AM but also with FM component).”*

ANSWER. Thank you for this comment. We agree that such an analysis would be of valuable support. We have had the chance to have a seminar from Dr Milan Palus from the Czech Academy of Sciences the day before the PhD defense by Marc Bengulescu in July 2017. Milan Palus is studying this amplitude modulation of high-frequency "noise-like" components by lower frequency ones using different methods than ours. We have evoked the possibility of joining forces. Unfortunately we could not afford such a study for the time being as this would have requested additional work which was fully out of reach in the present conditions, especially as the most skilled author (Marc Bengulescu) has left MINES ParisTech for a very demanding job in another domain. Anyway, this is still an open question at MINES ParisTech.

Paluš, M.: Multiscale atmospheric dynamics: cross-frequency phase-amplitude coupling in the air temperature, Physical review letters, 112, 078 702, doi:10/bhpj, 2014.

MINOR REMARKS.

Thank you for spotting these points. All of them have been taken into account – see text.

Answers to particular remarks.

*Page 6, line 1: why did you not include the residue in figure 3?*

This has been already explained in the first paragraph of the Result section. we have rephrased to make it clearer.

*Page 6, line 3: this is not properly correct. As you explained before, an IMF is a function whose envelopes are symmetric with respect to zero and not of zero mean.*

Yes, you are right. Corrected

*Page 7, Equation (7): for completeness, the integral should be a sum, since you have discrete time series*

Yes, you are right. Corrected

*Page 10, line 5: a visual inspection of figure 3 shows that only the first 3 IMFs seem to have a clear annual modulation*

Yes, we agree that the first 3 IMFs always exhibit a clear annual modulation. The text refers to a discussion of Fig. 4 and mentions in passing that in 2005 this modulation affects also the IMFs 1 to 5 in Fig. 3. We have slightly rephrased this part.

*Page 10, line 19: I suggest to insert a table with the characteristic periods of each IMF for the 4 data sets with the range of variability (this could be a benefit for the reader)*

Done

*Page 10, line 31: the transitional mode could be explained in terms of physical processes such as monsoon rainy seasonality?*

This could be tempting. We have not investigated this in depth. This could be contradicted by one result in the paper Bengulescu et al. (2017), where a similar transitional mode was found at Vienna (Austria, 159 days) and Kishinev (Moldova, 199 days), two locations which experience very different climates compared to Tateno.

Bengulescu, M., Blanc, P., Boilley, A., and Wald, L.: Do modelled or satellite-based estimates of surface solar irradiance accurately describe its temporal variability?, *Advances in Science and Research*, 14, 35-48, doi:10.5194/asr-14-35-2017, 2017.

*Page 13, line 6: I suggest to include some references about short-term solar rotational periodicities and related terrestrial signatures (see Prabhakaran, 2006; Emery et al, 2011, Morner, 2013)*

Done

*Page 16, line 19: I suggest to insert the background color below each matrix.*

Done