Atmospheric Measurement Techniques Discussions

Interactive comment on "Zernike polynomials applied to apparent solar disk flattening for pressure profile retrievals" *by* E. Dekemper et al.

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The paper 'Zernicke polynomials applied to apparent solar disk flattening for pressure profile retrievals' by Dekemper et al. summarizes adequately a very nice piece of work. In this work the authors have shown that pressure profiles can be characterized by the image made by the sun on an orbiting instrument that watches the sun occult. The particular characteristic used by the author is the set of moments associated with the first few Zernicke polynomials. The authors have broken the paper into three parts: the first is associated with how the observations are simulated and the Zernicke moments calculated, the second is how the information is extracted from the Zernicke moments and the third involves very simple testing. This paper demonstrates that the technique

has merit for instruments like ALTIUS and the imagers on SCISAT – I and is therefore appropriate for AMT. I look forward to seeing follow-on work that clearly demonstrates the capabilities and limitations of the presented technique.

I do not have many concerns nor questions about the content. However, I feel it is appropriate the authors address the following:

1) The abstract makes no mention of how the information is extracted from the Zernicke moments in order to match the content in the lookup tables. This method is the very important second part of the paper and should be addressed in the abstract.

2) No mention of limb darkening is made in either of the title or the abstract. Does this mean all of the information in the Zernicke moments is related to the shape or is the darkening profile important?

3) The authors should address in a paragraph or two how their method would be impacted if they were to have simulated a real three dimensional atmosphere instead of one with variation only in the vertical direction.

4) How exactly is the pixel intensity calculated in line 4 on page 7544.

5) On page 7548 line 2 the statement 'If the training set . . ." is quite important. I agree entirely with this statement but I am not convinced the authors have adequately demonstrated they have met the requirements as the profiles in the CIRA-86 atmosphere are average values over month and latitude bin and may not adequately represent the variability of the instantaneous pressure profiles. For my benefit could the authors comment on this? I think the Principal Component Analysis is an effort to demonstrate this but I'm afraid I was unable to completely follow the arguments.

6) It's not clear to me if the authors have addresses any conditions other than the sun being contained within the orbit plane. Could the authors comment on the impact that varying (spacecraft)-(orbit plane), or 'Beta', angles have on their technique. This Beta is not to be confused with the one defined in the work.

7) The discussion surrounding Figure 6 on page 7552 is extremely light on detail and description. Could the authors please expand this to tell me exactly what I'm supposed to take from the analysis?

8) The discussion and conclusion are borderline with respect to detail but because this paper is primarily about the technique I am happy to have only an expanded discussion around Figure 6 and the last section can remain as it is.

I recommend this paper be published after my comments have been adequately addressed.