

Interactive comment on “The global land Cryosphere Radiative Effect during the MODIS era” by D. Singh et al.

Anonymous Referee #1

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This paper presents a variation on the methodology of Flanner et al. (2011) Radiative forcing and albedo feedback from the Northern Hemisphere cryosphere between 1979 and 2008. Whereas Flanner et al., 2011 utilized AVHRR and microwave data, this study is updated to utilize higher resolution MODIS data, supplemented by the microwave based NISE product, and includes the southern hemisphere. Some interesting results from the analysis include the lack of trends in snow and ice covered area over the relatively short MODIS record, and similarity of results between the MODIS analysis and AVHRR analysis. Not surprisingly, this study finds that slightly more than half of the global cryosphere radiative effect comes from Antarctic perennial snow cover.

Ultimately, it is interesting to quantify the cryosphere radiative effect to understand how global energy balance may change as cryospheric extent declines with a warming cli-

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mate and albedo feedbacks. I found the method description to be technically adequate, but I think this paper would benefit from an expanded discussion of relevance and temporal scale of cryospheric response time: while we might lose half the cooling effects of the cryosphere if Antarctica melts- how realistic is that and over what time scales? Even if this is considered outside the scope of this paper, I think it might be useful to relay what the most immediate concern would be and it's associated CrRE.

The mixed use of LCrRE and CrRE acronyms is confusing, I would suggest using one acronym.

Line number suggestions and notes:

3926, Line 15: You give the timing and peak value for the Northern Hemisphere, but only mention the timing for the Southern Hemisphere- I suggest including both values or neither.

3927, Line 4: Consider changing 'cryospheric changes', which is vague, to 'changes in cryospheric extent' or, if you also intend to relay albedo feedbacks ' changes in cryospheric extent and reflectivity'.

3927, Sentence ending on Line 5: It sounds as if you are saying here that solely cryospheric changes determine the sensitivity of the climate to anthropogenic and external forcings, while you clarify in the next sentence that it is the third most powerful positive feedback, I would suggest altering this sentence.

3928, Satellite data description: It wasn't clear to me if the MODIS product used was binary (i.e. snow/no snow), and the snow presence parameter was fractional, or if both were fractional. If the MODIS product was not fractional snow coverage, do you think this spatial and temporal scale has any impact over the inclusion of snow in mountainous terrain, which exhibit high variability over relatively short temporal and small spatial scales? Is there reasoning behind using 16 days vs 8 days?

3929, Line 3: I would suggest instead of saying you 'apply' snow covered informa-

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tion from NISE, you state explicitly state that you fill missing data with snow covered information from NISE, since this is the title of the next section.

Section 2.2 title: Consider 'Global Albedo Climatology'

Section 3.1: It would help for interpreting results to keep the reportage of them consistent- for example, on page 3933, line 5-6, you report a 0.15% contribution of non glaciated regions in the southern hemisphere to global LCrRE and then a '3.7 time more' contribution of non-glaciated to glaciated regions in the northern Hemisphere- what are these absolute values, or percentage of global LCrRE? And then in line 8 it is stated that LCrRE associated with permanent glacier cover in mountain regions is 'clearly visible'- is there a value associated with this?

Flanner et al., 2011 is not in the reference list

Interactive comment on The Cryosphere Discuss., 9, 3925, 2015.