

## ***Interactive comment on “Winter tourism and climate change in the Pyrenees and the French Alps: relevance of snowmaking as a technical adaptation” by Pierre Spandre et al.***

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Received and published: 22 February 2019

General comments In this paper results from snowpack modeling tailored to ski resort operations and potential impacts of climate change are presented. From a regional perspective it is one of the view climate impact analyses for the ski industry in France, one of the most important ski markets in the world which has so far been under-researched. The applied model was already introduced elsewhere, but to my knowledge this is the first application for assessing the future perspectives of the ski industry. It is an important contribution as snowmaking - an important adaptation strategy - was included. I have some question in the methods section (see comments below) and I suggest to in-

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clude a paragraph in the discussion section on the “take-home message” of the paper. Apart from % changes illustrated in the results section, is it possible to evaluate the (near or longer term) future for skiing tourism in France and the Spanish Pyrenées? Is climate change a serious challenge, or manageable?

Specific comments p. 3, l. 2: Damm et al. (2017) did not include snowmaking in their assessment, so the reference does not match your statement “. . .and the snowmaking requirements so as to compensate the loss over Europe (Damm. . .). p.4, l.5: what is the justification for using the village elevation? p. 4, l.7-15: It is not clear to me what data was available in which region and which data you had to estimate. I understand that all data (village elevation, min/max elev., ski lift power and surface area) was available for France. As seen in Fig 1 you then estimated ski lift power (?) based on the surface area you drew from OSM and on the linear model derived from French ski resorts? Then you also had to estimate the elevations of Spanish/Andorran ski areas? Why that if you had OSM data? How can you explain the outliers in the OSM/BD stations figure? p. 5, l. 12: can you add some data on Spain as well? (the ski areas in this study represent xy% of ski lift infrastructures of Spain) p. 6, l. 11:  $150 \text{ kg/m}^2$  -> if it is density it should be  $\text{kg/m}^3$ ; this is an uncommon density for technical snow for base layer snowmaking, typically it is around  $400 \text{ kg/m}^3$  p. 8, l. 21-23: please explain why the village elevation is relevant in your assessment. Later on you refer to the “lowest elevation of the ski area”, this would be a clear explanation p. 9, l. 2. “snowmaking is limited to the lowest elevation and for a minority of seasons” -> I don't understand this sentence. How is snowmaking limited to a minority of seasons? Does that mean that snow is only produced in some years? p. 11, l. 4: “to decrease in the Pyrenees, up to 15%” -> here the sentence structure confused me a bit because “decrease” is followed by a positive number and in the same sentence there is 15% another time, but as increase. Maybe consider to split this sentence in two? p. 11, l. 5: what do you mean by “either in the Northern or Southern Alps”? Fig. 4/Discussion: how can you explain that the systematic bias is not existent in the Southern Alps?

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