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Comment on acp-2021-1073

Anonymous Referee #2

Referee comment on "Energy and mass exchange at an urban site in mountainous terrain – the Alpine city of Innsbruck" by Helen Claire Ward et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-1073-RC2>, 2022

This paper by Ward et al. presents an analysis of 4 years of micrometeorological data collected in Innsbruck, Austria, a small alpine city located at the bottom of Inn Valley and surrounded by complex topography. The analysis is mostly structured around radiation and energy budgets, with a particular focus on the impact of different meteorological patterns (valley-wind days vs foehn events vs pre-foehn events). If it is obvious that such a dataset is unprecedented, there is a great challenge to propose an interesting synthesis article. Well, the challenge was met! The article proposed by Ward is excellent from all points of view! The introduction is great, the objectives well defined and the methodology is clear. All the results are discussed exhaustively and put in perspective with numerous studies in the literature. The plots are flawless. The discussion is of high quality and the conclusions are relevant to the community and reflect well the results of the analysis. I have reviewed over 50 articles in my career and this is the first time I recommend accepting a manuscript as is (and without hesitation even)!

Among the points I liked most about the paper, the mixing ratio of CO₂ that becomes completely flat during foehn events, the quantification of energy storage in the urban canopy and anthropogenic energy sources (heating, etc.), the fact that stable conditions are very rare, even in winter, and the link between atmospheric boundary layer properties and atmospheric transmissivity.

I take my hat off to all the co-authors of this excellent paper which fully deserves to be published in ACP.