Response to Interactive comment on "The Copernicus Polar Ice and Snow Topography Altimeter (CRISTAL): Expected Mission Contributions" by Michael Kern et al.

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Dear Laurence

Thank you for this careful review and your suggestion on the introduction of Ka-band SARIn for CRISTAL over land ice in addition to its current capabilities.

The capabilities and needs for the altimeter, in particular for what concerns the interferometric mode, have been extensively studied in Phase A/B1 by the industrial teams and discussed with the Mission Advisory Group. The Ka-band channel has mainly been introduced to improve snow depth retrievals over sea ice, for which interferometry is not required.

You are correct to note that the addition of a Ka-band interferometer would obviate the need for a reference elevation model when resolving phase ambiguities present in Ku-band interferometric data.

However, although phase ambiguities occur in areas of rugged terrain, it has been shown (e.g. Helm et al., 2014; McMillan et al., 2014; McMillan et al., 2016) that the use of a single frequency Ku-band interferometric altimeter allows for the determination of ice sheet elevation and elevation change to an accuracy that greatly exceeds the measurement requirements identified in the mission planning stages, and so in this regard a second interferometer is surplus to requirements.

Moreover, the addition of a second interferometer has been assessed to be a significant burden to the mission budget and schedule, presenting a risk to the availability of polar altimetry in the 2020's.

For these reasons, a second Ka-band interferometer is no longer part of the CRISTAL mission design.

Best regards,
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