Brief comment on "*A model study of the energy and mass balance of Chhota Shigri glacier in the Western Himalaya, India by F. Pithan*"

Is the ASTER GDEM hypsometry reliable on Chhota Shigri glacier?

It is beyond my scientific expertise to assess the quality of the energy balance modelling presented in this paper. However, I was surprised and, initially, worried by the use in this modelling effort of the hypsometry derived from the ASTER Global Digital Elevation Model (known as GDEM and freely available at https://wist.echo.nasa.gov/api/). Indeed, several authors already pointed out the limitation of this DEM (ASTER GDEM Validation Team, 2009), in particular over ice-covered areas *(e.g., Nuth and Kaab, 2011)*.

I thus compared the GDEM hypsometry of Chhota Shigri (15.7 km²) with the hypsometry that we used previously *(Wagnon et al., 2007)* to estimate the glacier mass balance during four hydrological years (2002-2006). Our hypsometry (referred as SPOT5 hypsometry) was obtained by combining two DEMs derived each from a pair of 2.5-m SPOT5 satellite stereo-imagery acquired in 2004 and 2005.

On Chhota Shigri, GDEM also shows some artefacts that have been reported for other regions (bumps, mole run…, see *ASTER GDEM Validation Team, 2009)* but the average elevation difference with the SPOT5 DEM is **only 5 m**, a small difference that should not influence the modelling effort by F. Pithan. Furthermore, the distribution of ice-covered areas with altitude is consistent between the two DEMs (Figure 1).

Thus, GDEM seems to be a reasonable dataset to obtain the hypsometry of remote ice-covered areas such as Chhota Shigri glacier. However, its limitations for mapping elevation changes remain: e.g., changing (and unreported) time stamp for each pixel of the DEM, unreliable elevation pixels in the textureless accumulation areas not masked out, …

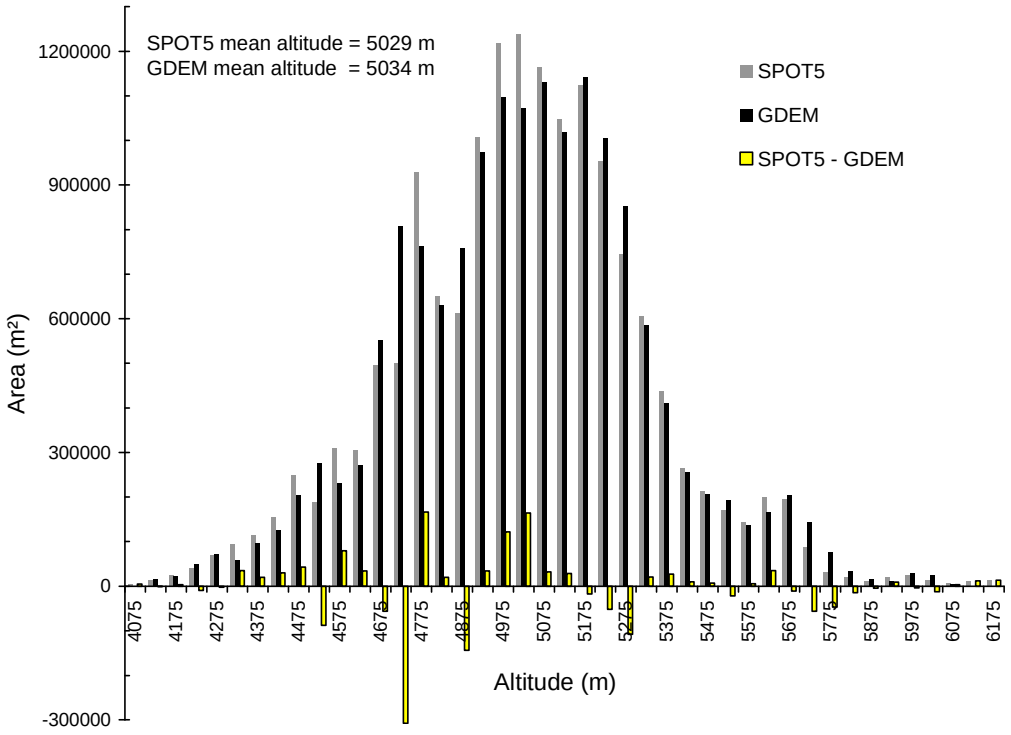

Figure 1: Hypsometry of Chhota Shigri glacier derived from the SPOT5 DEM (grey) and the ASTER (black) GDEM. In yellow, the difference for each altitude band.

Toulouse, 4 February 2011
Etienne Berthier

References

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