The Cryosphere Discuss.,
https://doi.org/10.5194/tc-2019-262-AC2, 2020

The Cryosphere
Discussions

Interactive comment on "InSAR time series analysis of seasonal surface displacement dynamics on the Tibetan Plateau" *by* Eike Reinosch et al.

Eike Reinosch et al.

e.reinosch@tu-braunschweig.de

Received and published: 3 February 2020

Thank you very much for your helpful comments, we will reply to them in the same order.

l. 153: done

l. 164: The temporal baselines of our interferograms are 12 to 60 days for the Niyaqu basin and 12 to 72 and 12 to 96 days for the Qugaqie basin ascending and descending orbits respectively. Spatial baselines of Sentinel-1 are indeed small compared to other satellite systems and in most cases there are no problems. We discarded a small

number of interferograms with relatively long spatial baselines (∼200 m) due to poor coherence. We will remove the mention of spatial baselines from this section, as the low coherence rather than the spatial baselines of those interferograms were the deciding criteria. We attached the connections graphs of both study areas and both orbits to this comment (Fig. 1). We will adapt the relevant paragraph in our manuscript to describe the temporal baselines of our data sets and clarify our choice regarding the spatial baselines.

l. 205: Thank you for pointing this out, this paragraph is not correct. It should read: "the orbital phase was removed by subtracting a constant simulated phase from our interferograms. We then estimate a 3rd order polynomial function over flat stable areas and subtract this phase to remove any remaining large scale phase ramps."

l. 214: The publication linked is already part of our reference list. We cite it in l. 479.

l. 199: We attached a Figure (Fig. 2) to this comment showing the spatial coherence of our ascending data set over the Qugaqie basin (which has the highest percentage of low coherence data points). The low coherence brackets (0.1 to 0.2 and 0.2 to 0.3) are almost exclusively found near rivers and lakes and in this data set they represent 1.3 % and 3.0 % respectively. In our other data sets the data points with coherence values <0.3 represent <1 % (Qugaqie descending and Niyaqu ascending) and 2 % (Niyaqu descending).

l. 310: We will make the suggested changes.

ll. 382-384: We agree and will make the suggested changes.

Figure 3: We will adjust the legend as suggested. The acknowledgements were included due to a request to do so by editorial staff of "The Cryosphere" after the submission of our manuscript and prior to the opening of the discussion.

l. 259, ll. 531-532 and l. 571-572: Thank you very much for this comment. We will answer be referencing our descending data set of the Qugaqie basin, as it features both the fastest moving landform at up to 8 cm/yr in LOS and then longest temporal baselines (96 days in summer 2016 and 72 days in summer 2017). The coherence of this landform is 0.35 to 0.5. We attached a time series diagram of the cumulative surface displacement at this location (Fig. 3 top). Interferograms of 2018 feature temporal baselines of 12 to 36 days but also do not show seasonal variations in velocity. The longest temporal baseline of 96 days corresponds to a maximum surface velocity of 10.6 cm/yr. It is therefore likely that the velocities of the fastest landforms are being underestimated but not to a huge degree, as the temporal baselines are generally between 12 to 36 days. And only a small number of interferograms in the summer of 2016 and 2017 have long baselines when an underestimation of the displacement is likely. We do not believe that this is the cause of the lack of a seasonal signal in these landforms, as the time series of those landforms do not show an acceleration of their velocity in summer 2018 either. The temporal baselines of summer 2018 are 12-48 days. This is also corroborated by slightly slower landforms (∼4 cm/yr LOS) with similar surface characteristics as the fastest landforms, which also display this linear motion pattern but are less likely to suffer from an underestimation of the displacement signal. Figure 3 (bottom) displays the cumulative surface displacement of two different landforms with velocities ∼4 cm/yr LOS. The landform corresponding to the green line has similar surface characteristics as the fastest landforms and moves at a constant velocity, while the landform corresponding to the red line shows a strong seasonal signal. We will update the relevant paragraphs to show that we considered the possibility of underestimating the displacement signals of the fastest landforms.

Interactive comment on The Cryosphere Discuss., https://doi.org/10.5194/tc-2019-262, 2019.

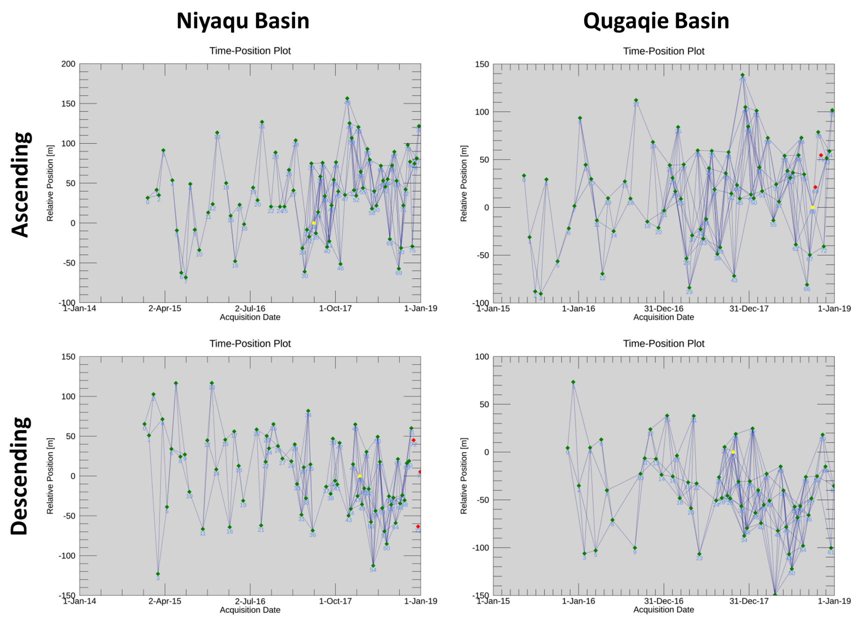

Figure 1: *SBAS connection graphs of ascending and descending data sets for both study areas. Data acquisition shown in red were discarded due to poor coherence of interferograms.*

Fig. 1.

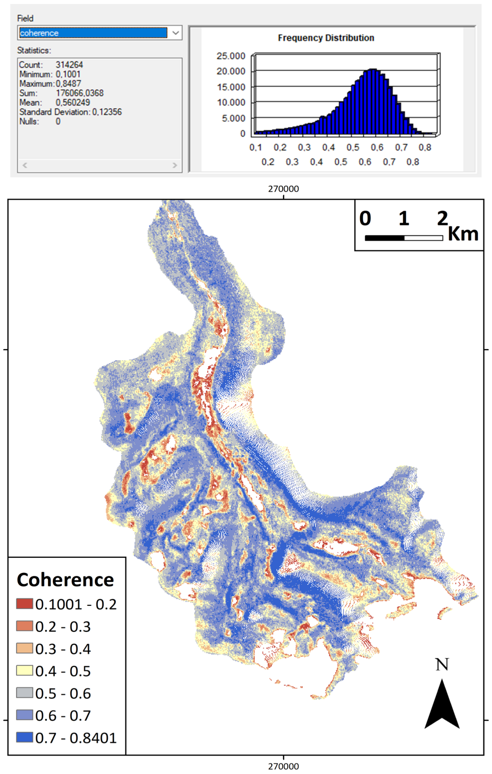

Figure 2: Histogram (top) and spatial distribution (bottom) of coherence values of the SBAS analysis of Qugaqie basin in ascending orbit.

Fig. 2.

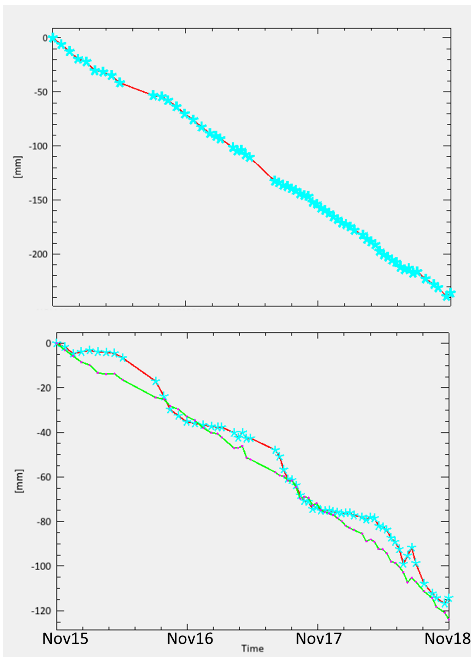

Figure 3: *Cumulative LOS displacements of the fastest landform at ~8 cm/yr (top) and two different landforms with velocities of ~4 cm/yr (bottom) in Qugaqie basin in descending orbit.*

Fig. 3.