Seasonal behaviour of the C-band interferometric coherence over fire disturbed areas in southern Siberia

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Introduction

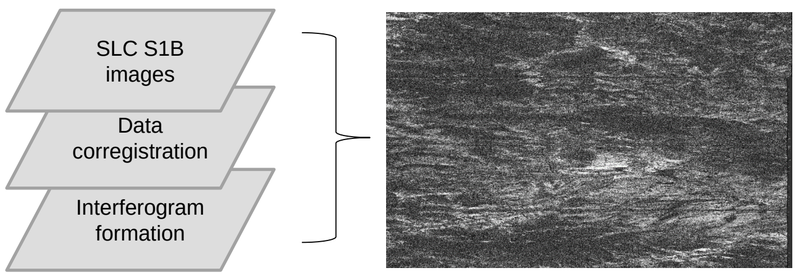
Siberian circumpolar boreal forests are ecosystems of great sensitivity to the ongoing climate warming and with extreme weather seasonality. During the last decades, these ecosystems face recurrent wildfire events and as a result, post-fire vegetation either returns to its pre-fire conditions or is subject to changes in species composition.

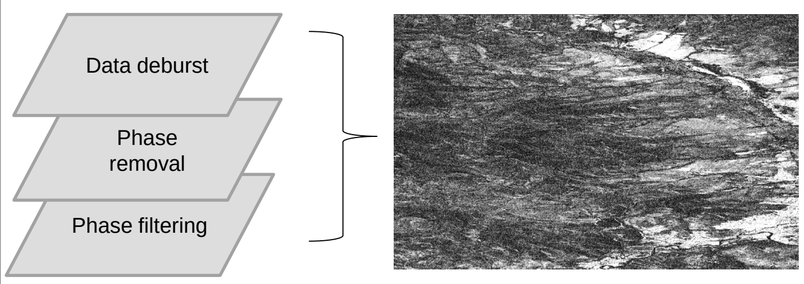
A known problem in the study of the circumpolar boreal forests with the use of Synthetic Aperture Radar (SAR) systems is the extreme weather seasonality and its impact on the SAR signal.

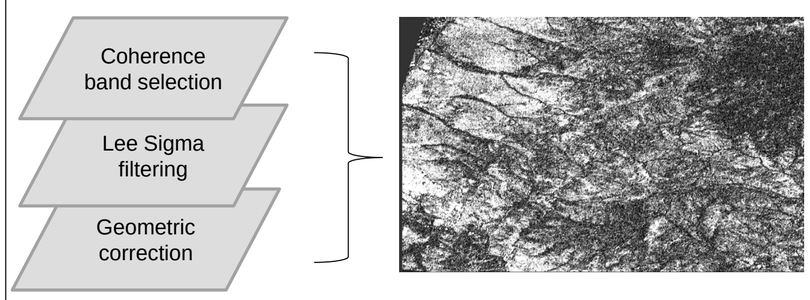
Here, we investigate the seasonal behaviour of the C-band interferometric coherence over fire disturbed areas with different recruitment trajectories, in southern Siberia.

Our preliminary results indicate higher values during the winter period and over the poorly recruiting site in Chita city.

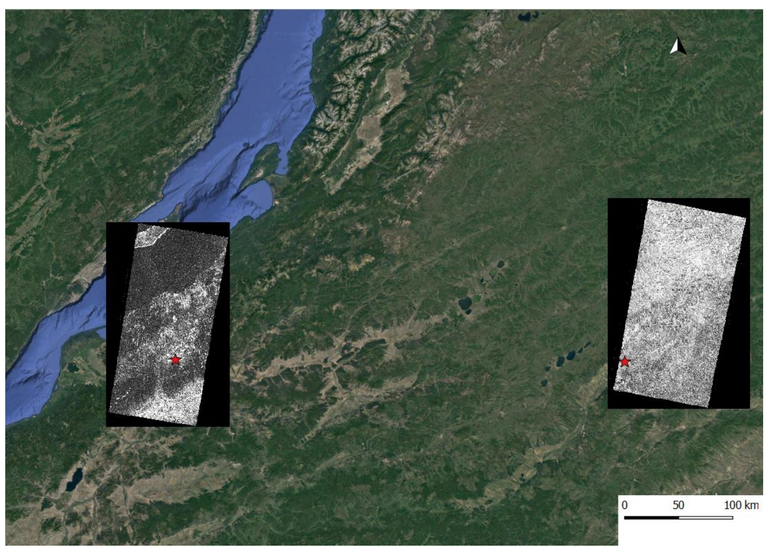
Processing chain







1. Generation and processing of the interferometric C-band coherences as proposed by the ESA.

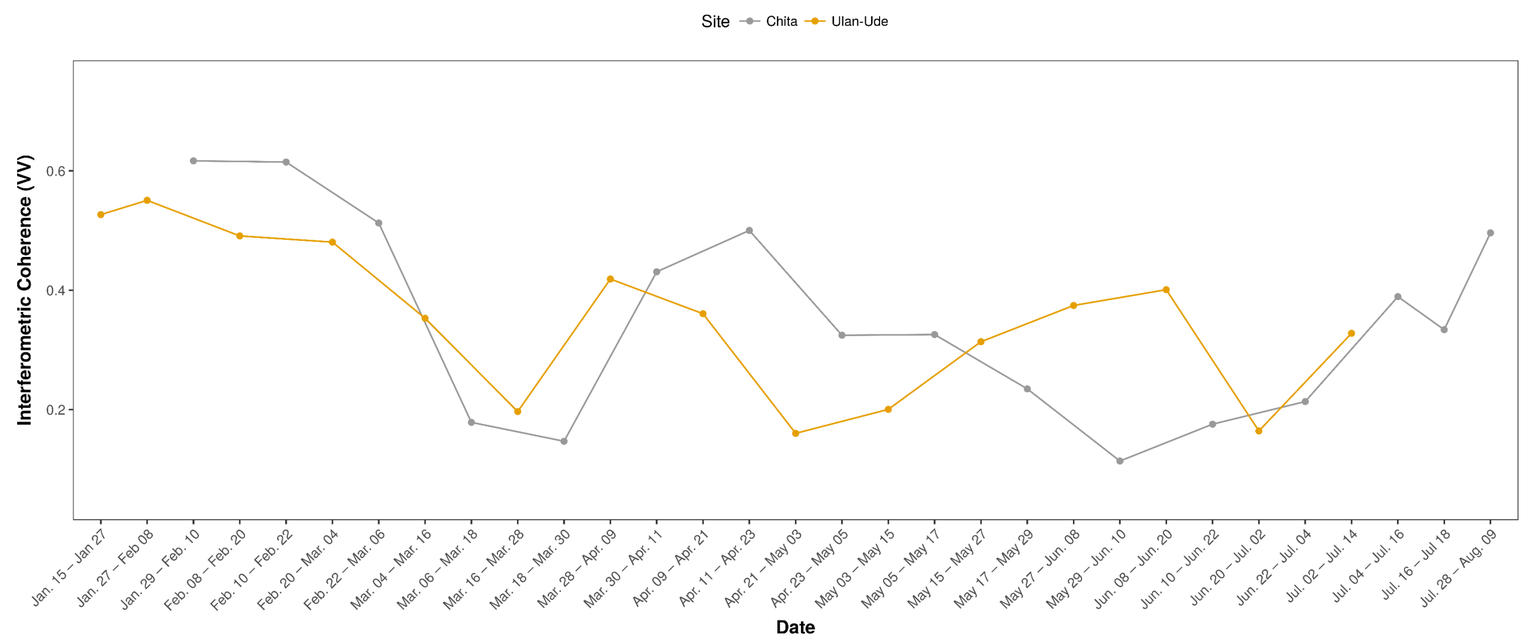


2. Areas of interest. The post-fire poorly recruiting site of Chita is located in the eastern part of the region. In the western part of the region is the abundant recruiting site of Ulan-Ude.

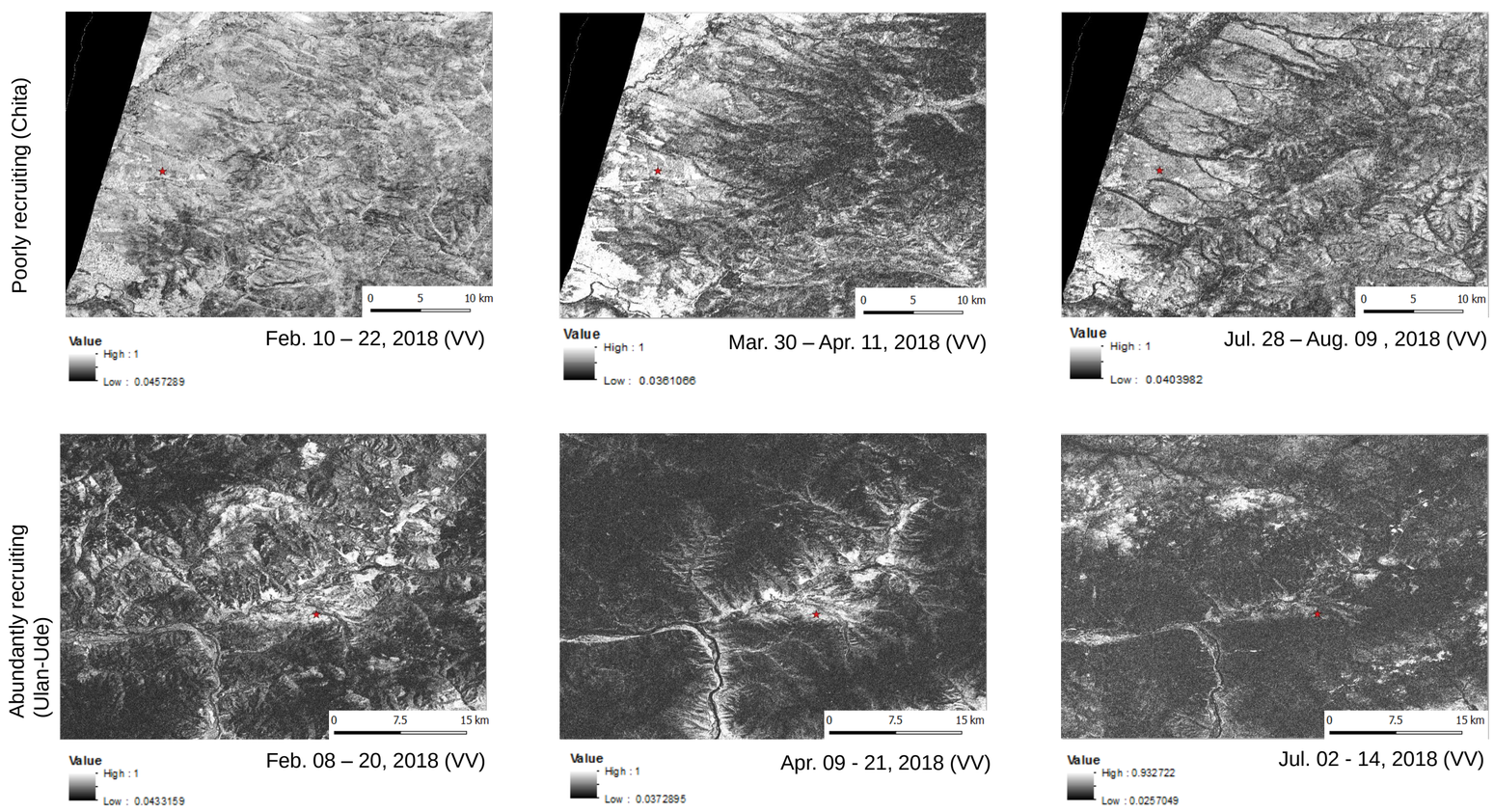
3. (a) Poorly recruiting site in Chita city (eastern site). The post-fire landscape is characterised by grass and a few stumps.

3. (b) Abundantly recruiting site in Ulan-Ude city (western site). The landscape is characterised by intense post-fire tree regeneration.

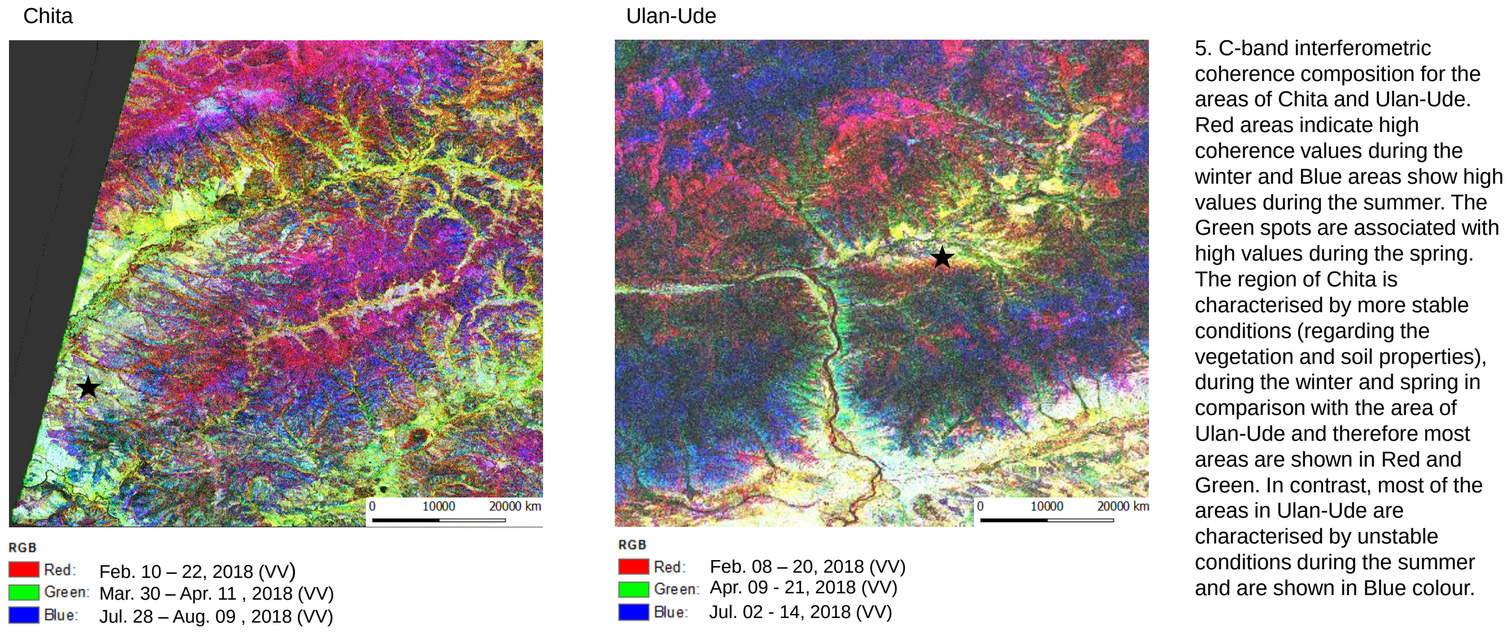
Results



3. Seasonal behaviour of the interferometric C-band coherence (VV) over a poorly recruiting site (Chita) and an abundantly recruiting (Ulan-Ude), at point level. The levels of coherence appear to be higher for the poorly recruiting site, likely due the negligible volume scattering (see photo 3.(a)). Both sites are characterised by similar winter-behaviour-patterns as during that period, the coherence values are greater than 0.5. During the spring and summer, allochronic value fluctuations occur between the sites. For the explanation of these asynchronous value variations, further analysis of interferometric coherence pairs in conjunction with weather and in-situ data is required.



4. Spatial visualisation of the interferometric C-band coherence over the wider regions of Chita and Ulan-Ude. The white areas are indicative of high values while the black areas are characterised by low coherence.



5. C-band interferometric coherence composition for the areas of Chita and Ulan-Ude. Red areas indicate high coherence values during the winter and Blue areas show high values during the summer. The Green spots are associated with high values during the spring. The region of Chita is characterised by more stable conditions (regarding the vegetation and soil properties), during the winter and spring in comparison with the area of Ulan-Ude and therefore most areas are shown in Red and Green. In contrast, most of the areas in Ulan-Ude are characterised by unstable conditions during the summer and are shown in Blue colour.

Conclusions and future work

- The coherence values are higher during the winter for both areas, probably due to the particularly low temperatures which result in almost stable dielectric soil properties.
- The poorly recruiting site of Chita is characterised by higher winter-values most likely due to the relatively homogenous landscape, with only a few or zero tree-scatterers.
- The abundantly recruiting site of Ulan-Ude is characterised by lower values, probably due to the tree regeneration which creates a more diverse landscape with higher volume scattering.

The current work will continue with the analysis of the in-situ data, collected during our field-visit on the summer of 2018. We will examine the impact of seasonality on the detection of vegetation levels through the use of auxiliary weather data, allometric equations and the C-band interferometric coherences.

Acknowledgements and personal information

The work presented here is still ongoing.
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