

(AC)³: A German initiative to study Arctic Amplification: Climate Relevant Atmospheric and Surface Processes, and Feedback Mechanisms

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Within the last decades, dramatic changes of a variety of climate parameters have been observed in the Arctic. In particular the remarkable increase of the Arctic near-surface air temperature, i.e. Arctic Amplification, exceeds the global warming by a factor of two. Coupled regional and global climate models still fail to reproduce features like the observed sea ice decline adequately. This model-observation difference implies that the underlying physical processes and feedback mechanisms are not adequately represented in Arctic climate models and thus predictions of these models are also likely to be inadequate. Different modelling studies aimed at identifying the relative importance of the different feedback mechanisms in the Arctic, e.g., ice-albedo, water vapour, lapse-rate, and meridional transports and exchanges between ocean, troposphere, and stratosphere. As a result there is no consensus about the mechanisms dominating Arctic Amplification.

In order to disentangle the various factors of Arctic Amplification, three German Universities (Leipzig, Bremen, Cologne) and two non-university research institutes (Alfred-Wegener Institute, TROPOS) have proposed the establishment of a Transregional Collaborative Research Centre (CRC). Within the CRC we want to make use of concerted observations from satellite, aircraft, tethered balloon, research vessel, and a number of ground-based sites. This will be integrated in a series of dedicated campaigns, combined with long-term measurements. The field studies will be conducted in different seasons and meteorological conditions; they will be performed in an international context and in close collaboration with modelling activities. A hierarchy of models will be employed to bridge the spatio-temporal scale differences from individual processes to climate signals. The models will serve to guide the campaigns, to analyse the measurements and sensitivities, to attribute the origins of ongoing observed Arctic climate changes, and to test the ability of regional and global climate models to reproduce observations.

Abstract – **MAXIMUM: half a page**, format A4, English UK, justified, in word (not in pdf) to be sent directly to Ms. Françoise Labonté at francoise.labonte@esa.int