Life cycle properties of isolated convection over Germany from one year: A pathway to improve satellite-based thunderstorm nowcasting?

Stephan Lenk[1], Fabian Senf[1], Hartwig Deneke[1]

1 Leibniz Institute for Tropospheric research

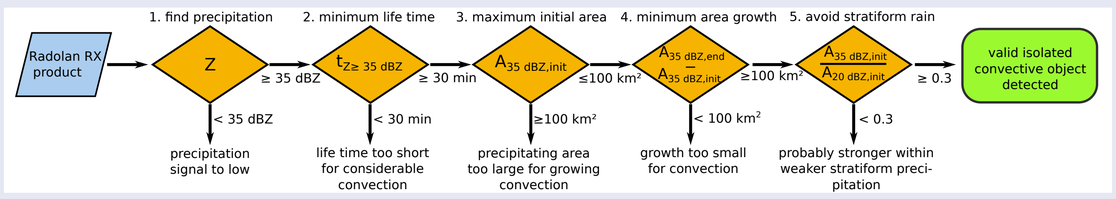
contact: stephan.lenk@tropos.de

Motivation

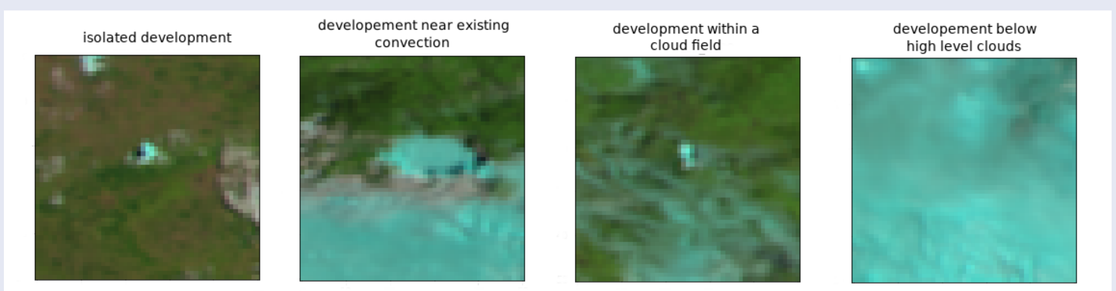
Thunderstorms are an intriguing but also dangerous part of continental weather. To decrease the related impacts, an early and reliable nowcasting is required. Despite of the improvements in numerical weather models, convection is still challenging to be predicted reliably. This is due to the nature of the processes involved in forming deep convection and the rather short time scales of these processes. One promising approach is to use the capabilities of geostationary satellites to detect developing convection in its early phase and thus to increase the lead time for warnings and to aid in improving the models. Here we explore some satellite derived life cycle properties of isolated convection over Germany for 2013 to gain insights, in how the properties develop for four different subjectively defined types of isolated convection.

Isolated convection – a novel approach

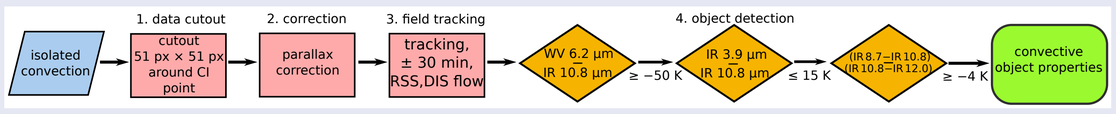
- radar-based isolated convection, modified approach after [1]:



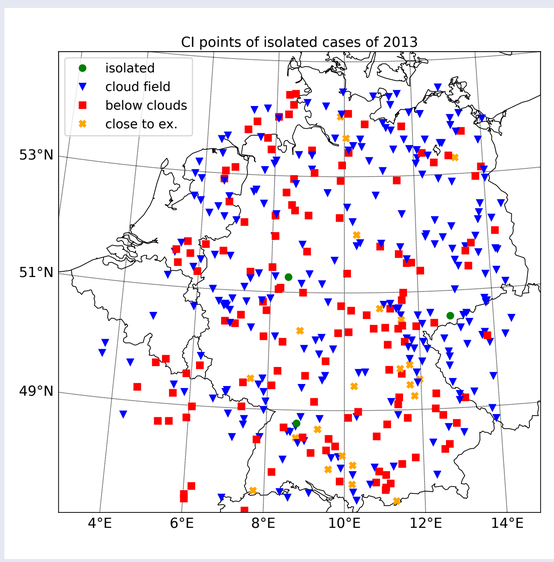
- manual classification of radar-based isolated convection (only day time):



- object detection, inspired by SEVIRI RGBs

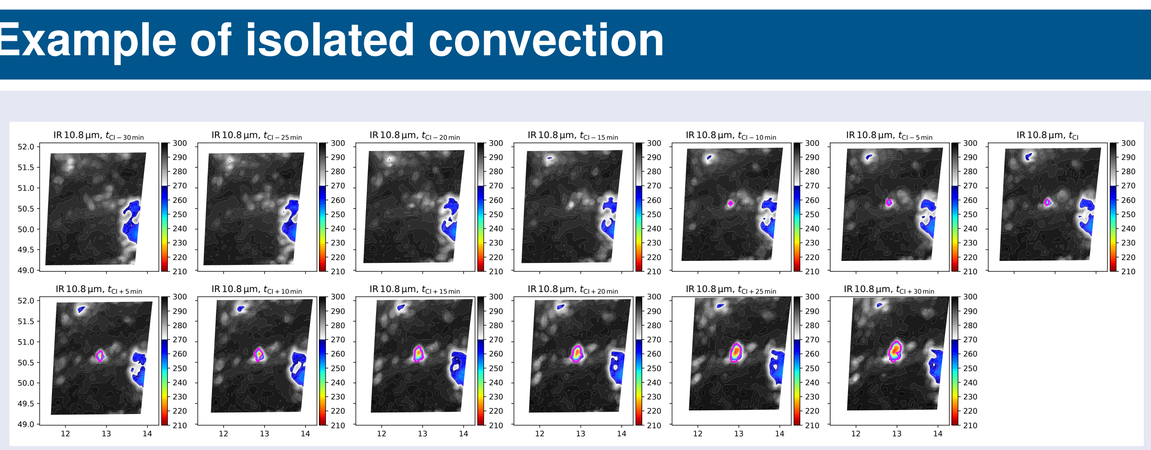


Isolated convection 2013

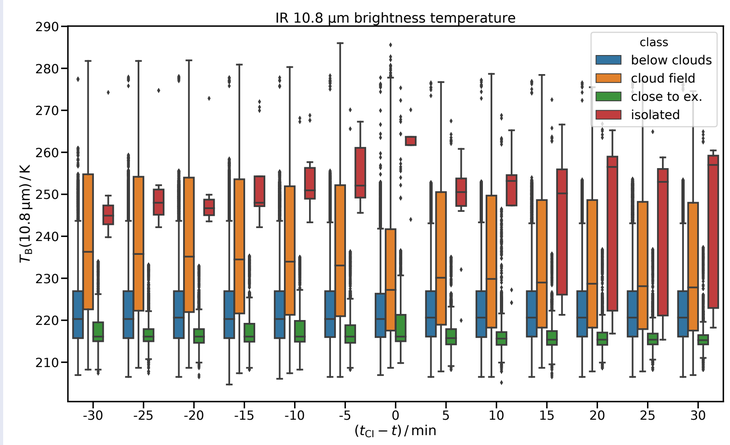


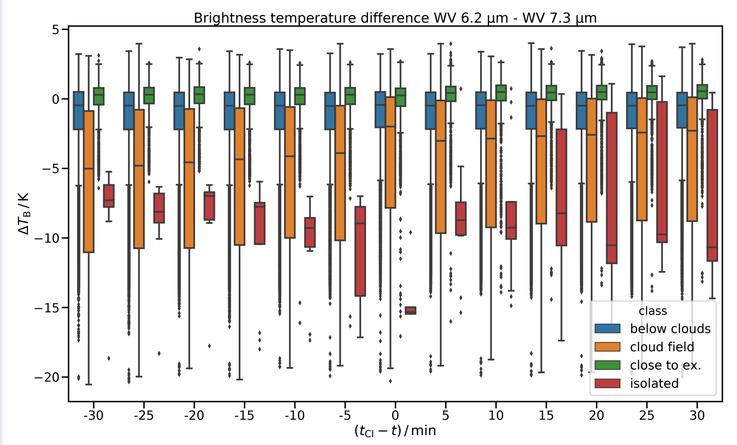
class	number
isolated	3
close to existing	22
below clouds	138
cloud field	242
total	405

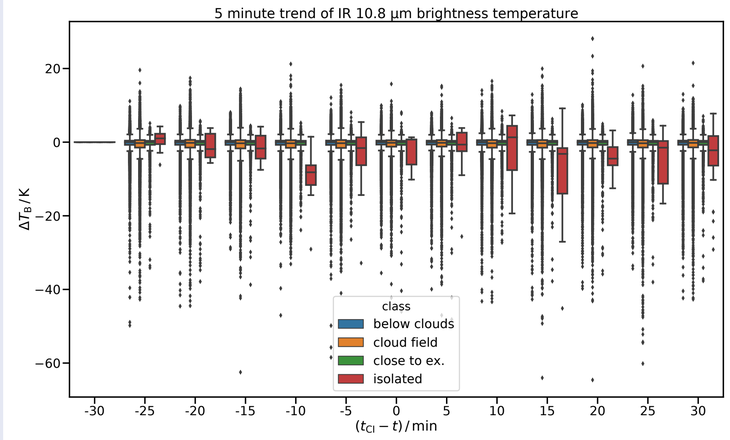
Example of isolated convection

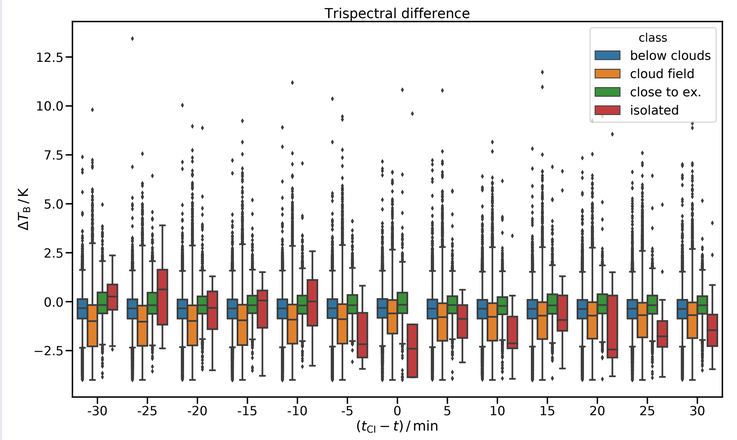


Life cycle properties









Summary and Outlook

- isolated convection defined by weather radar for one year
- 405 cases after filtering to avoid non-convective precipitation
- subjective classification into four categories
- only little number of isolated cases from satellite perspective
- largest fraction of cases hard to detect from satellite
- for isolated cases detectable by satellite, 10 to 15 min lead time ahead of precipitation
- more robust conclusions possible with larger data set (10 years of RSS, 2008 to 2018)

References

[1] Haberlie, A.M., W.S. Ashley, T.J. Pingel, 2015: The effect of urbanisation on the climatology of thunderstorm initiation – Quat. J. Roy. Met. Soc 141, 663–675.