

## Announcement of a topic for:

**Research** **X**  
**Seminar Methods** **X**  
**Master Theses** **X** (please mark one or more)

Topic	Insect population and trends from weather radar
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Second Reviewer	Heike Kalesse-Los
Description	<p>Biodiversity is on the decline, partly due to the changing climate. A prime example is the decline in flying insects that, however, so far mostly is documented from surface traps (van Klink et al., 2020). It is known that atmospheric radar observations can detect insects (Zrnic and Ryzhkov, 1998; Jatau et al., 2021; Kwakye et al., 2022).</p> <p>Here we propose to make use, for the first time, of the German weather radar network for this, and to link the radar expertise at LIM with the expertise in biodiversity at the German Centre for Integrative Biodiversity Research (iDiv). Specifically, we have obtained ground truth data for insects from a suction trap at the Julius Kühn Institute in Quedlinburg, and co-incident polarimetric radar observations. The first step in the Master's work is to develop a random forest machine learning model to detect and quantify flying insects in the DWD radar data. Potential further steps would be to quantify the insects in a large radar sample and to identify climate influences on insect abundance.</p>
Literature	<p>Jatau, P., et al., A machine learning approach for classifying bird and insect radar echoes with S-band polarimetric weather radar, <i>J. Atmos. Ocean. Tech.</i>, 38, doi:10.1175/JTECH-D-20-0180.1, 2021.</p> <p>Kwakye, S., H. Kalesse-Los, M. Maahn, P. Seifert, R. Van Klink, C. Wirth, and J. Quaas, Classification of flying insects in polarimetric weather radar using machine learning and aphid trap data, <i>Atmos. Meas. Tech. Discuss.</i>, doi:10.5194/amt-2023-69.</p> <p>Van Klink, R., et al. Meta-analysis reveals declines in terrestrial but increases in freshwater insect abundances, <i>Science</i>, 368, doi:10.1126/science.aax9931, 2020.</p> <p>Zrnic, D. S. and Ryzhkov, A. V.: Observations of insects and birds with a polarimetric radar, <i>IEEE Transact. Geosci. Remote Sens.</i>, 36, doi:10.1109/36.662746, 1998.</p>