Announcement of a topic for:

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

Topic	Homogenization of echo intensities of different weather radar frequencies in an operational framework
Release Date	Aug 31, 2023
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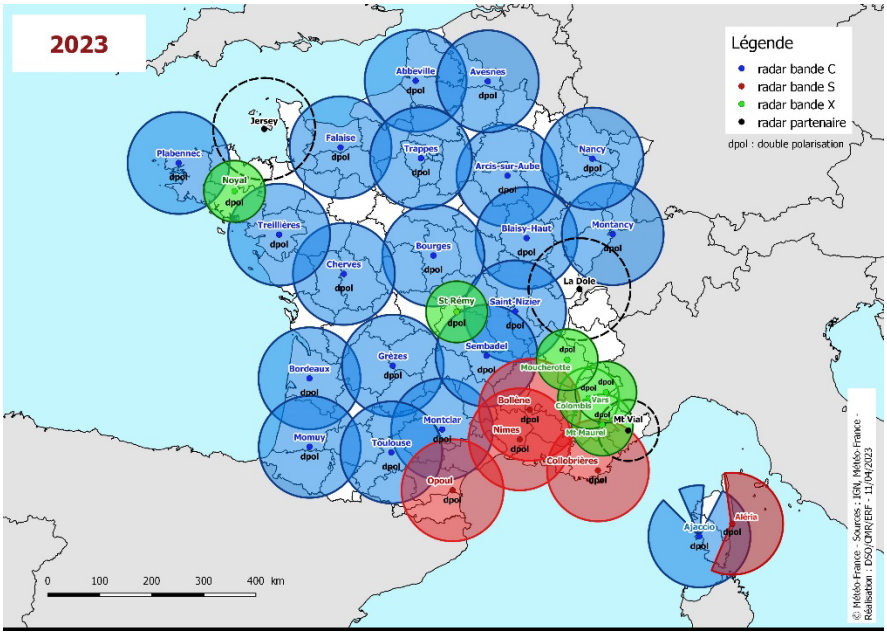
Description:	Meteo France operates scanning radars at different frequencies (specifically, S-band, C-band, X-Band) in a radar composite (OPERA Programme). Each radar type has specific characteristics for signal strength (radar reflectivity), signal attenuation, and clutter occurrence. In order to derive best estimates of precipitation rates, a homogenization of the echo intensities of the different radars has to be made. Here we propose to use a month-long radar test data set from MeteoFrance (see MeteoFrance radar network). C-band radars will be used as reference instruments. Depending on the geographical region, an overlap of C-, S-, and/or X-Band radars exists in France. For some ideal situations, volumes with an overlap of all three radar frequencies are available. For the combination of two- or three radar frequencies, an algorithm will be developed which describes a functional relationship of echo strength between the different radar frequencies. As a first step, a precipitation- and range-dependent attenuation correction will be tested and applied (Doviak and Zrnic, 1993). For situations with extreme precipitation, quality flagging for non-correctable situations with extreme attenuation will be created. The attenuation-corrected radar reflectivity signals will then be homogenized, e.g., linear regression equations for different precipitation strengths will be derived. In a final step, the corrected radar reflectivities will be compared to hourly rainfall estimations from ground-based rain gauges for validation of the effect of the correction (homogenization). As a potential further step, situations with hail occurrence will be analyzed in depth. The master thesis work is supposed to lead to an operational radar product yielding best estimates of precipitation rates and hail size for use at Meteologix.com.

Literature:	Doviak, R.J., Zrnic D.S., 1993: Doppler Radar and Weather Observations, 562 p, 2nd edition, Academic, San Diego, CA. MeteoFrance radar network: Paz et al., 2019: Small-Scale Rainfall Variability Impacts Analyzed by Fully-Distributed Model Using C-Band and X-Band Radar Data, Water,DOI: 10.3390/w11061273  https://www.dwd.de/EN/specialusers/research_education OPERA EUMETNET Programme publications: https://www.eumetnet.eu/activities/observations-programme Vaisala Application Note: https://www.eurelettronicaicas.com/files/prodotti/