ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

SRNWP at FMI

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Operational 2019

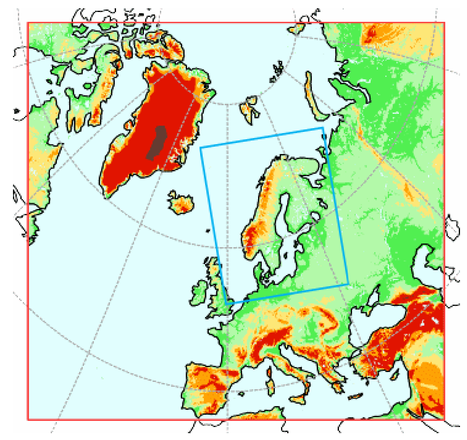
As a member of a Nordic **MetCoOp** cooperation with Norway and Sweden, FMI participates in developing and running a common high resolution ensemble prediction system called **MEPS** based on non-hydrostatic convection-permitting **Harmonie-Arome** developed in a code cooperation with Météo-France and ALADIN. MetCoOp also develops an hourly updated rapid refresh cycle based on Harmonie-Arome, currently running in a pre-operational mode.

Forecast production within MetCoOp is distributed among the participating institutes.

Additionally, FMI continues to run hydrostatic NWP model **HIRLAM** with horizontal resolution of 7.5 km. It is maintained at version 7.4 but not developed any more.

Model Integration areas

Harmonie-Arome (MEPS) Hirlam



DOWNSTREAM & RELATED APPLICATIONS

SILAM	Particle dispersion & chemical transport model	Gases CBM-4, CBM-5 expansions, halogens & stratospheric aerosols - nuclear emergency preparedness - forest fires, volcanic ash
-- POLLEN	Long-range natural pollen transport	Alder, birch, olive, grasses, mugwort, ragweed
LAPS	Local analysis and prediction system	Hourly analyses of surface and upper air variables
RoadSurf	Road weather model	State of road surfaces and pedestrian pavements, road maintenance advice, intelligent traffic
Marine models (for Baltic)	WAM OAAS, WETEHINEN 2D HELMI HBM 3D	Wave model forecasts Storm surge forecasts Sea ice forecasts Water circulation forecasts
Hydrological models	Managed by the Finnish Environment Institute (SYKE)	

Harlequin ladybird (*Harmonia axyridis*) invasion into the UK

Background

- Harlequin ladybird (*Harmonia axyridis*) is an invasive alien species in Europe, becoming rapidly widespread following its first record in England in 2003
- It is native in Eastern Asia, but has been introduced as biological control agent, e.g., in the USA and Europe. Unfortunately, it eats not only aphids but also, e.g., larvae of native ladybirds causing their demise
- Anthropogenic transport by ships and planes is known, but could atmospheric events explain the dispersion to the UK better?

Material and methods

- Atmospheric models (NWP + ADM) have been used to estimate potential routes of the Harlequins from continental Europe to the UK.
- SILAM ADM (http://silam.fmi.fi/) and ECMW's IFS (http://www.ecmwf.int/)
- The SILAM footprints from the early records in England in 2004 (Fig. 1)
- The SILAM forward simulations from the known source areas in France, Belgium and the Netherlands for 2004-2005 (Fig. 2)

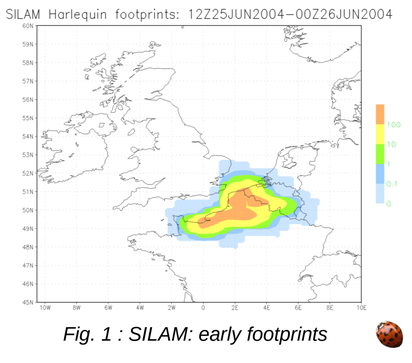


Fig. 1 : SILAM: early footprints

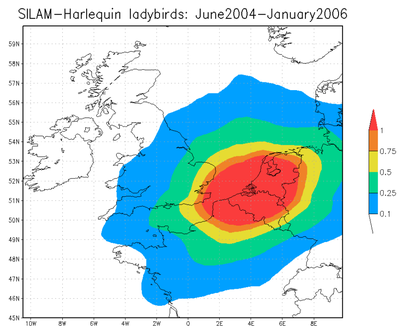


Fig. 2 : SILAM: forward simulation

Results

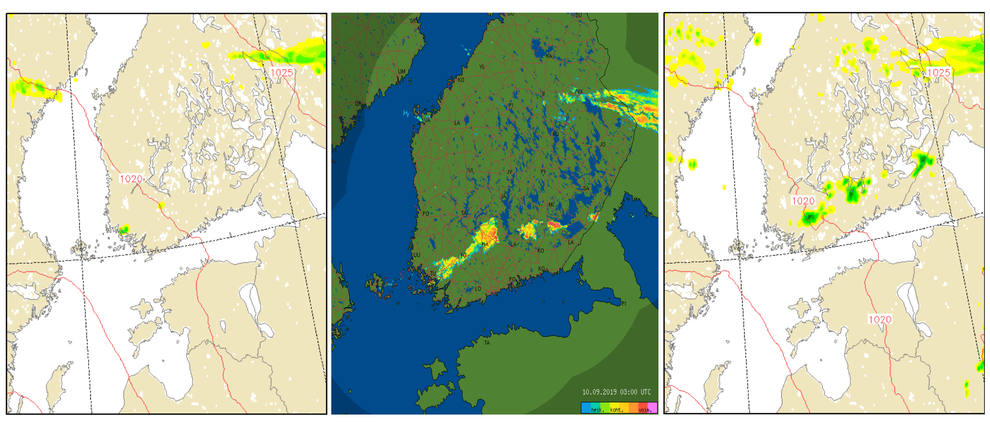
- SILAM suggests that harlequin ladybirds can cross the English Channel 1-2 times a week on average during the study period.
- If the weather is favourable, Harlequins can fly over the English Channel in 1-3 hours, which is a fully feasible flying time.
- The SILAM results are consistent with early harlequin ladybird records.
- Year 2005 was a more favourable for crossing the English Channel than 2004. After 2005, Harlequins spread rapidly in the UK.

Want more?

Siljamo P, Ashbrook K, Comont R, Skjøth C: *Do atmospheric events explain the arrival of an invasive ladybird (Harmonia axyridis) in the UK?* https://doi.org/10.1101/68145 (preprint)

Satellite based cloud ingest for nowcasting

Case-study 10 September 2019: Convective precipitation with thunder over Southern Finland



MEPS control *Radar echoes* *MNWC*

Forecast initial time: 20190910, 00Z. Valid time: 03Z (+3h fc.)

- The MetCoOp HARMONIE-Nowcasting (MNWC) system is running at every hour, with a short cut-off (15 min) of observations
- Current setup is using first-guess from MEPS and a short-range forecast (+9h) is produced at 2,5 km resolution, with GRIB2 output every 15 min
- The short cutoff-time (15 min) penalizes conventional observations but the frequent analysis update gives more satellite data
- Ingest of MSG-NWCSAF cloud information at the start of the forecast improves the convection initialization. This has been implemented into MNWC, together with short-cutoff GNSS observations
- Assimilation of AMV's, Mode-S and public NetAtmo observations, as well as use of GridPP and increased vertical/horizontal resolution, are being considered for future development of the MNWC

FLake verification in HIRLAM

Lake surface state in the FMI operational HIRLAM for years 2012-2018 was validated against observations from Finnish Environment institute. The lake freezing was generally well simulated while melting occurred too early and maximum summertime water temperatures were overestimated.

Fig. 1 shows the observation points used: lakes with both lake surface water temperature (LSWT) and lake ice freeze-up/melt-up dates (white); lakes where only dates available (black). Lakes where also ice thickness and snow depth measurements were used (Lappajärvi, Kilpisjärvi and Simpelejärvi) are surrounded with a large white circle.

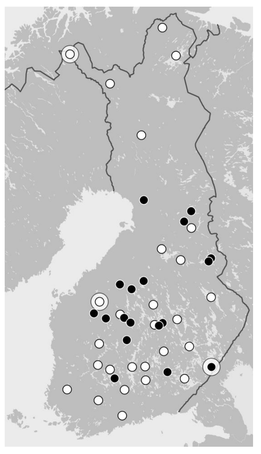


Fig. 1 : Observation map

As an example, Fig. 2 shows time-series of the observed, analysed and forecast LSWT at the Kilpisjärvi observation location (20.82 E, 69.01 N) for 2014-2015 based on 06 UTC data. Markers are shown in the inserted legend. Observed freeze-up date (blue) and break-up date (red) are marked with vertical lines.

Reference

Rontu L, Eerola K, and Horttanainen M: *Validation of lake surface state in the HIRLAM v.7.4 numerical weather prediction model against in situ measurements in Finland*. Geosci. Model Dev., 12, 3707–3723, https://doi.org/10.5194/gmd-12-3707-2019, 2019.

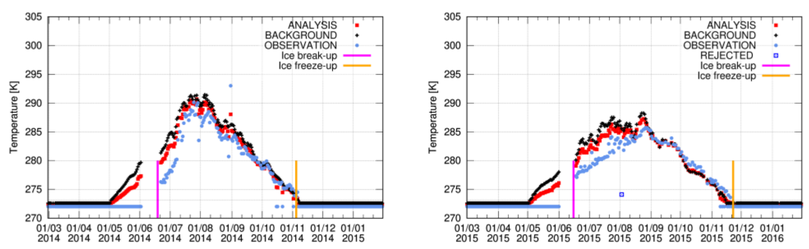


Fig. 2 : Example time series for 2014-2015 (lake Kilpisjärvi)