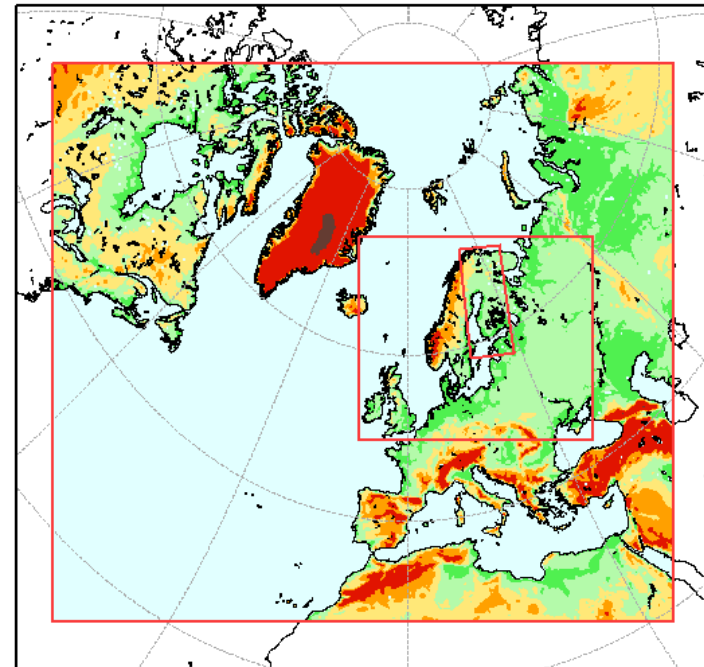# NWP@FMI

Carl Fortelius and the NWP team
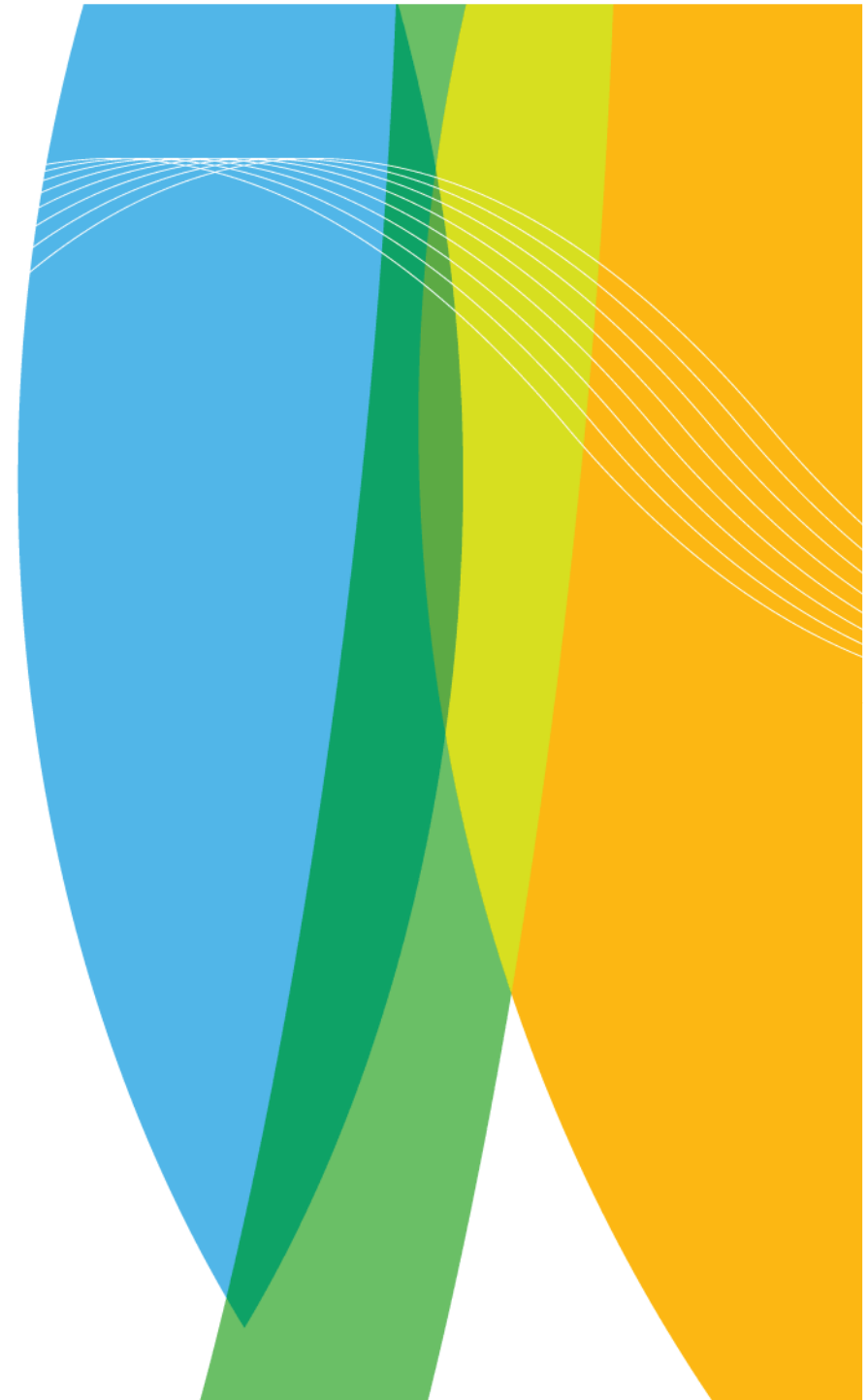
Numerical weather prediction systems

- **IFS (ECMWF)**
  - Synoptic scale medum-range and long-range
  - LBCs for in house LAMS
- **HIRLAM Forecasting System**
  - Short-range
  - Down-stream applications
  - LBCs for high-resolution LAMs
- **HARMONIE Forecasting System**
  - High-resolution short range
- **LAPS analysis system**
  - Frequent meso-scale analyses
  - Expermental

IFS -> HIRLAM {RCR, MB} -> AROME

Details of HFS version 7.2

|			
Upper air analysis	**4-dimensional variational data assimilation**	**Forecast model**	Limited area grid point model
Version	HIRLAM 7.2	Version	HIRLAM 7.2
Parameters	surface pressure, wind components, temperature, specific humidity	Basic equations	Primitive equations
Horizontal grid length	0.15 degrees on rotated lat-lon grid	Independent variables	longitude, latitude, hybrid level, time
Domain	582 x 448 grid points	Dependent variables	log. of surface pressure, temperature, wind components
Levels	60 hybrid levels		sp. humidity, sp. cloud condensate, turbulent kinetic energy
Observation types	TEMP, PILOT, SYNOP, SHIP, BUOY, AIREP, ATOVS AMSU-A brightness temperatures	Horizontal grid	Arakawa-C
		Horizontal grid length	0.15 degrees on rotated lat-lon grid
Background	3 h forecast from previous cycle	Integration domain	582 x 448 grid points
Assimilation window	6 hours	Levels	60 hybrid levels
Observation windows	1 hour	Integration scheme	Semi-Lagrangean semi-implicit, time step 360 s.
Data cut-off time	2 h for main cycles, 4 h 20 min for intermediate cycles	Orography	Hirlam physiographic data base, filtered
Assimilation cycle	6 h cycle, reanalysis step every 6 h to blend with large-scale features of the ECMWF analysis.	Physics	* Savijäravi radiation scheme
			* Turbulence based on turbulent kinetic energy
Surface analysis	Separate analysis, consistent with the mosaic approach of the surface/soil treatment		*** Rasch-Kristjansson condensation scheme**
			* Kain-Fritsch convection scheme
	* sea surface temperature, fraction of ice		* Surface fluxes according to drag formulation
	* snow depth		* Surface and soil processes using mosaic approach
	* screen level temperature and humidity	Horizontal diffusion	Implicit fourth order
	* soil temperature and moisture in two layers	Forecast length	54 hours
		Output frequency	Hourly
		Boundaries	* "Frame" boundaries from the ECMWF optional BC runs
			* Projected onto the HIRLAM grid at ECMWF
			* Boundary file frequency 3 hours
			* Updated four times daily

The HARMONIE Forecasting System

- **AROME cycle cy33h1**

- **Initial state and LBCs: HIRLAM MB**

- **24 hour forecasts initialized at 00 and 12 UTC**

- **300x600 grid points, distance 2.5 km**

- **40 levels**

- **Output every 15 minutes**

- **Post porcessing includes a radar reflectivity simulator and comparison whith measurments in real time**
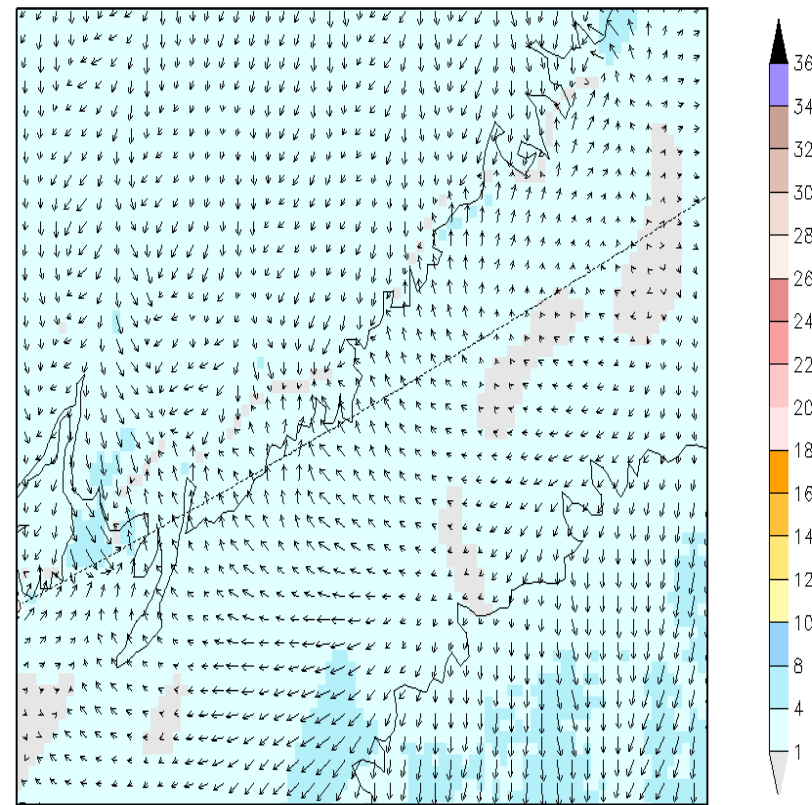
A sea breeze case seen by AROME

Observed wind speed and direction
10 UTC 22April 2008
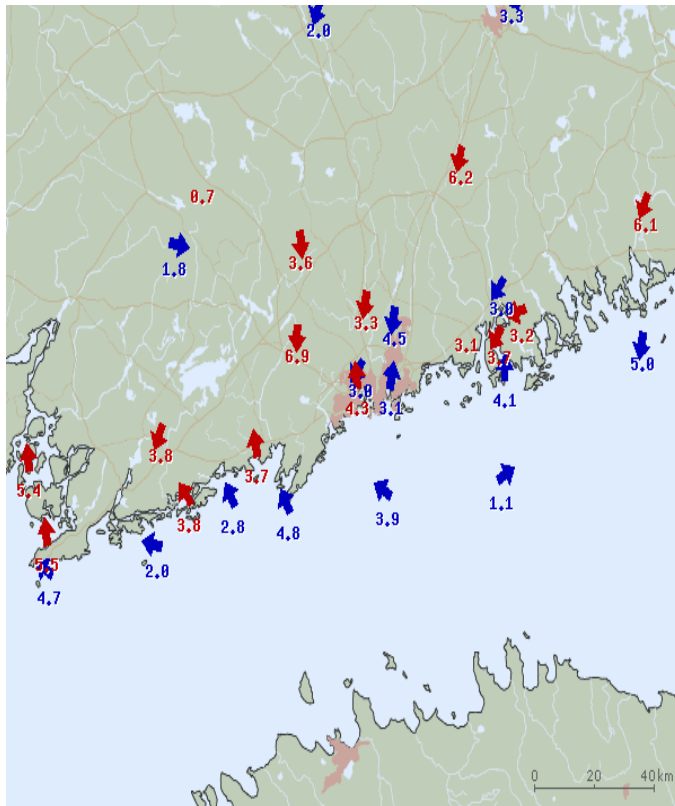
AROME 22APR2008 00 UTC Forecast. 10m wind [ms⁻¹].
22APR2008 12 UTC (aro32h2,2.5km)

Max_wind: 5.51963

20.10.2008   5

A sea breeze case seen by AROME