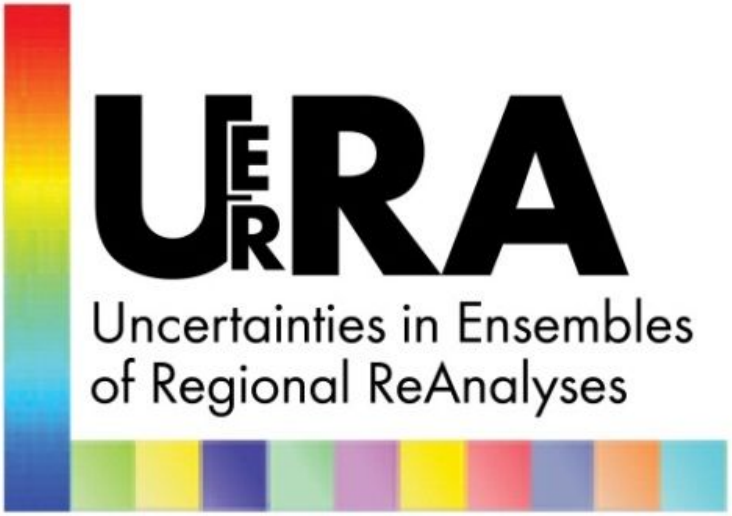

SMHI

HARMONIE RA: years done , archiving, retrieval, products and examples

Presented at the UERRA Showcase Workshop in Reading 23-24 nov 2016

Esbjörn Olsson
SMHI

Contents:

- Status: years done and archiving
- Retrieval from MARS
- Products and examples: Wind Energy theme

Status

- The Harmonie RA is run in several parallel streams.

- Present status of the runs:
  - 1961-1969 at July 1966
  - 1970-1978 at Feb 1974
  - 1979-1989 at Nov 1984
  - 1990-1999 at Nov 1994
  - 2000-2005 at Jan 2005
  - 2006-2010 done
  - 2011-2015 done

- Data is stored in ECFS at ECMWF in GRIB1 format

Archiving

- All fields are converted to GRIB2 using ECMWF grib-api.
- Some of our parameters had to be re-calculated due to unit differences between GRIB1 and GRIB2
  - E.g. relative humidity and cloud cover
- One GRIB2-file per day and level type is put into MARS, total size ~ 8 GB.

Archiving

- Five different level types; sfc, pl, ml, hl and soil.
- Analysis and Forecast; an and fc.
- Forecast lengths 00Z and 12Z:
  - 01, 02, 03, 04, 05, 06, 09, 12, 15, 18, 21, 24, 27, 30
- Forecast lengths 06Z and 18Z:
  - 01, 02, 03, 04, 05, 06

Archiving

- Soil: 2 parameters, 3 levels (only 6 hour forecasts).
- Surface: 29 parameters.
- Model levels: 4 parameters, 65 levels (only analysis).
- Height levels: 7 parameters, 11 levels.
- Pressure levels: 8 parameters, 24 levels.

For more details: https://software.ecmwf.int/wiki/display/UER

Archiving

- Present status:
  - 2006-2008 done.
  - Just started 2009 and 2010.
- One year takes approximately two weeks.
- Will take about a year to get it all into the archive running two years in parallel with present speed
- There are some options to increase the speed.

Retrieval

ECMWF

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About | Forecasts | Computing | Research | Learning

Navigation

- Home
- MARS Catalogue
- MARS Activity
- Job list

See also...

- FAQ
- Accessing forecasts
- GRIB decoder

MARS Catalogue

Date (24 values)	Time (4 values)	Step (14 values)	Level (11 values)	Parameter (7 values)
2007-07-01	00:00:00	1	15	Pressure
2007-07-02	06:00:00	2	30	Relative humidity
2007-07-03	12:00:00	3	50	Specific cloud ice water content
2007-07-04	18:00:00	4	75	Specific cloud liquid water content
2007-07-05		5	100	Temperature
2007-07-06		6	150	Wind direction
2007-07-07		9	200	Wind speed
2007-07-08		12	250	
2007-07-09		15	300	
2007-07-10		18	400	

- Check for availability
- View the MARS request
- Estimate download size
- Retrieve the selection in GRIB or NetCDF (experimental)

Note about availability

Some of the fields may not be archived at all levels or all forecast time steps. Before retrieving data you may want to check the availability of the requested fields. For that, follow the *Check for availability* link.

Retrieving

In order to retrieve data, you must select at least one item in the lists above. You can select more than one item in each list.

Current selection:

levtype **hl** , pl , sfc , sol
month jan , feb , mar , apr , may , jun , **jul**
year 2006 , **2007** , 2008
type an , **fc**
stream **oper**
origin **eswi**
expver **prod** , test
class at , be , ch , co , cs , de , dk , dm , dt , e2 , e4 , ea , ei , el , em , en , ep , er , es , et , fr , ie , it , la , mc , me , ms , nl , no , nr , od , pt , pv , rd , rm , s2 , se , te , ti , to , tr , uk , **ur** , yt

Top of page

Retrieval

MARS request:

```
retrieve,
  class=ur,
  date=2008-08-01/to/2008-08-31,
  expver=prod,
  levelist=100/150,
  levtype=hl,
  origin=eswi,
  param=10/54/130/157/246/247/3031,
  step=1/2/3/4/5/6,
  stream=oper,
  time=00:00/06:00/12:00/18:00,
  type=fc,
  target=$grib2file
```

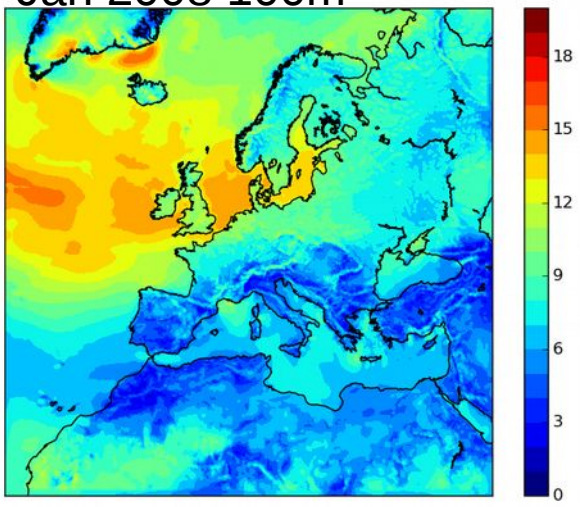
Products and examples

- This MARS request will produce hourly data for one month at levels 100 and 150 m above model ground level.
- Data appropriate for wind energy studies.
- Whole 2008 was retrieved this way.
- Some examples of possible ways to use the data will be shown.

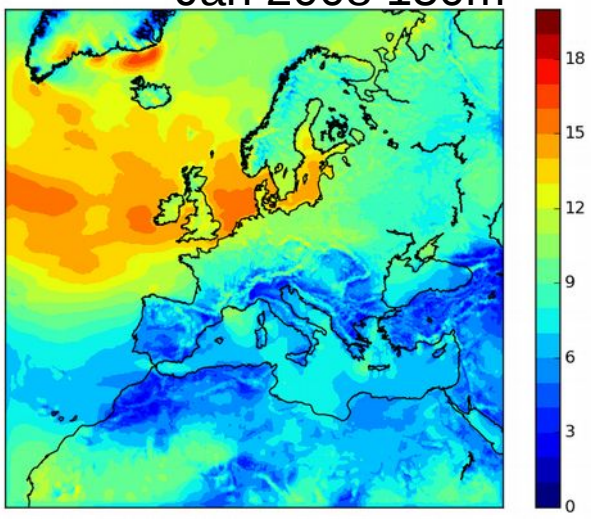
Products and examples

Monthly mean wind speed m/s

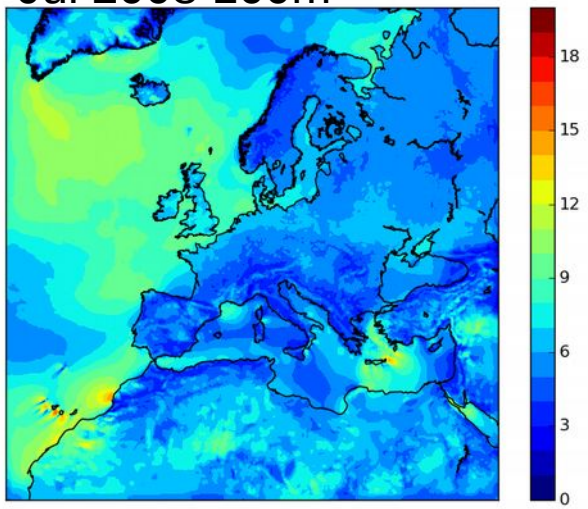
Jan 2008 100m



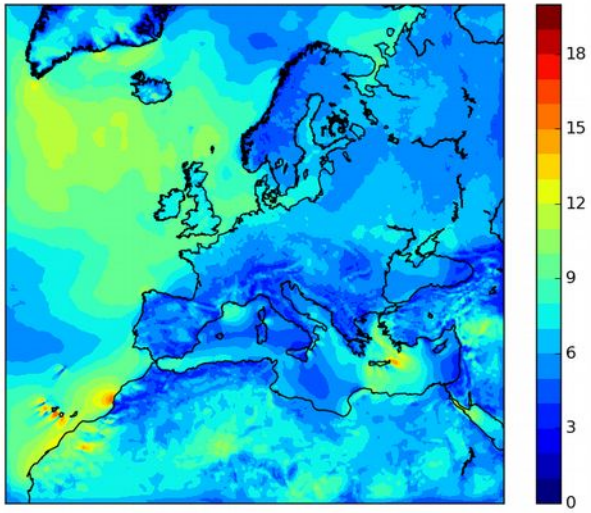
Jan 2008 150m



Jul 2008 100m



Jul 2008 150m

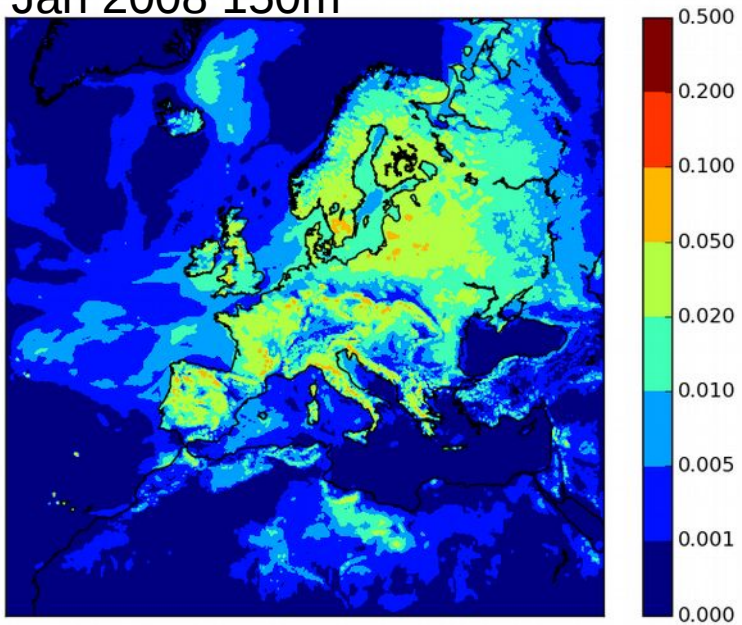


Products and examples

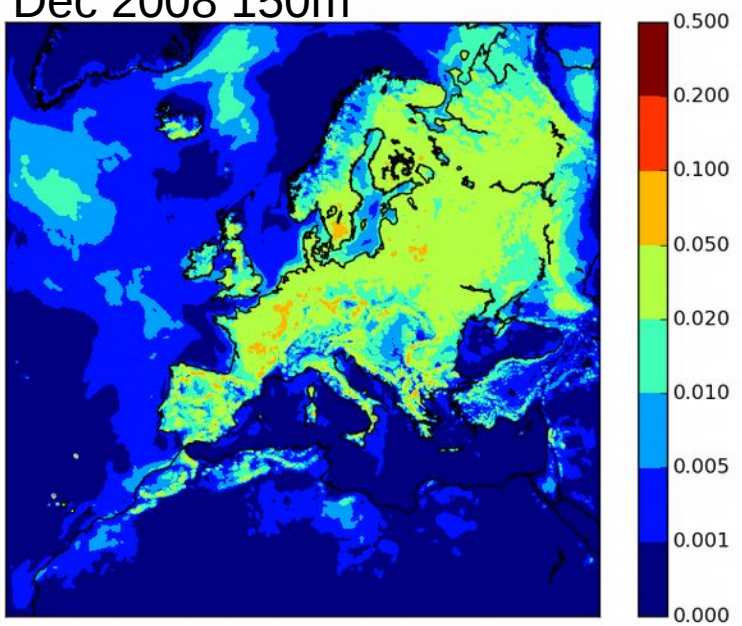
Monthly mean cloud liquid water content g/kg

Icing problems?

Jan 2008 150m



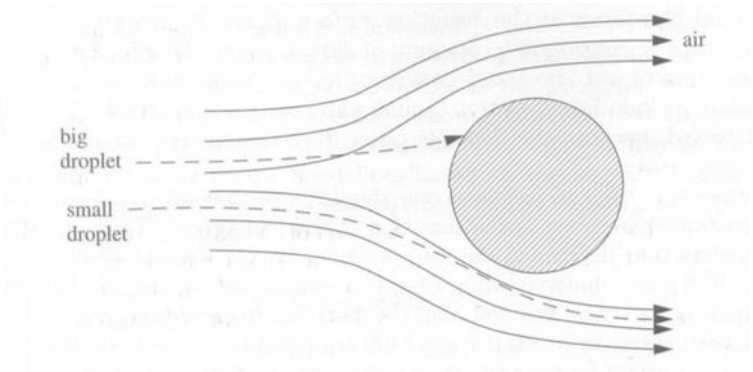
Dec 2008 150m



Products and examples

- Site specific calculations:
  - How much of the power production will be lost due to icing?
  - Use ice accretion model to calculate i

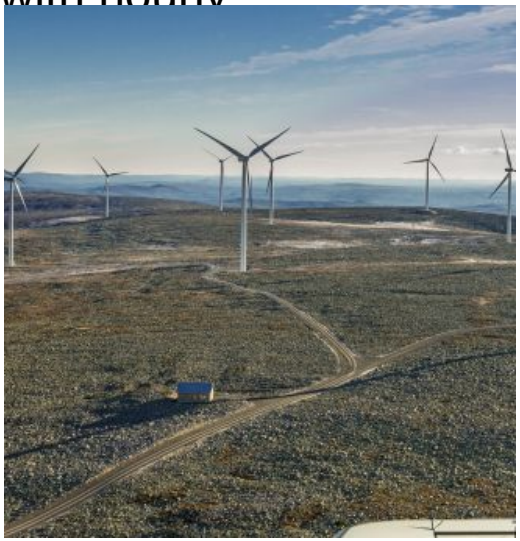
$$\frac{Dm}{dt} = \alpha_1 \alpha_2 \alpha_3 wAV - Q$$



  - Ice accretion model needs wind speed, temperature, cloud liquid water content and relative humidity as input.
  - Time series of the resulting icing rate and ice load can be used as input to a production loss model.

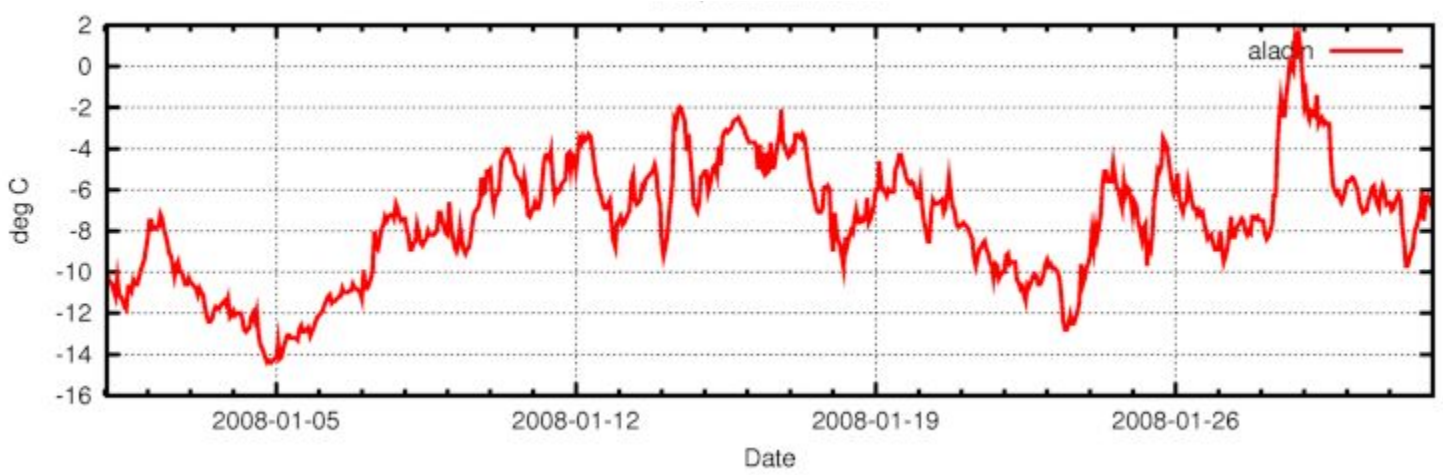
Products and examples

- Test on wind power site in the middle of Sweden:
  - Glötesvålen, 2MW wind turbine.
  - 980 m above sea level.
  - Atmospheric data adjusted vertically.
  - Ice model and power production loss model runs with hourly UERRA-data.
  - One month; Jan 2008.

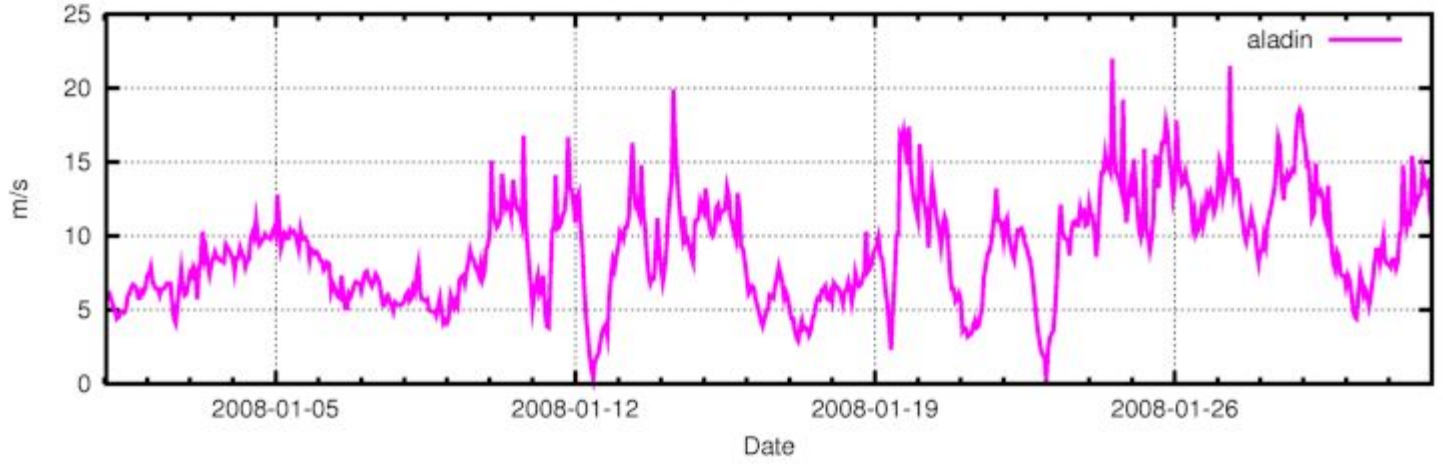


Products and examples

Temperature Glötesvålen 150m January 2008

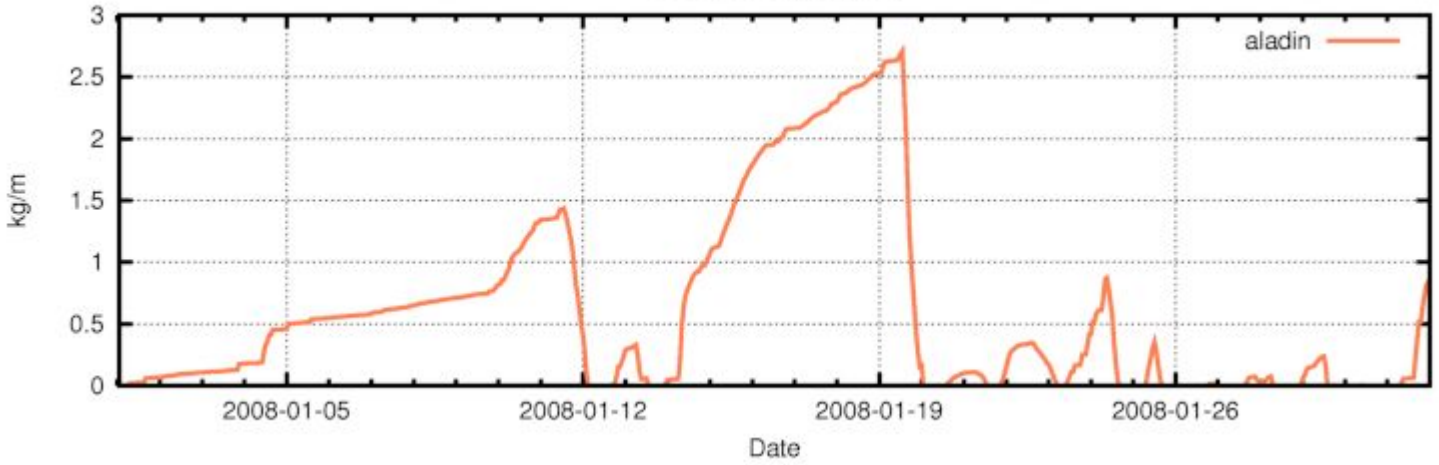


Wind speed Glötesvålen 150m January 2008

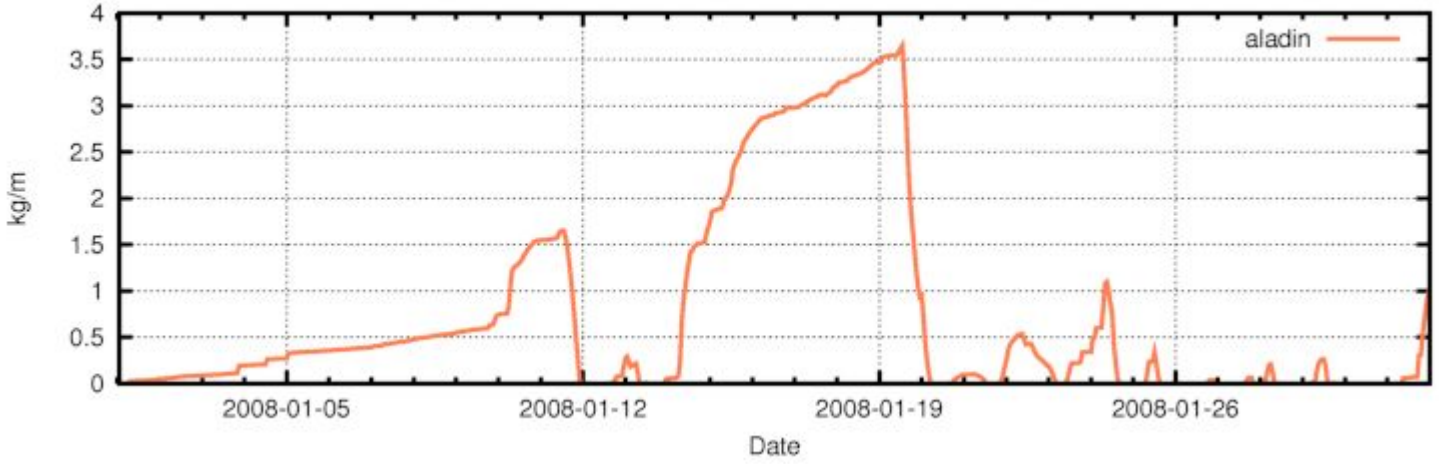


Products and examples

Ice load Glötesvålen 100m January 2008

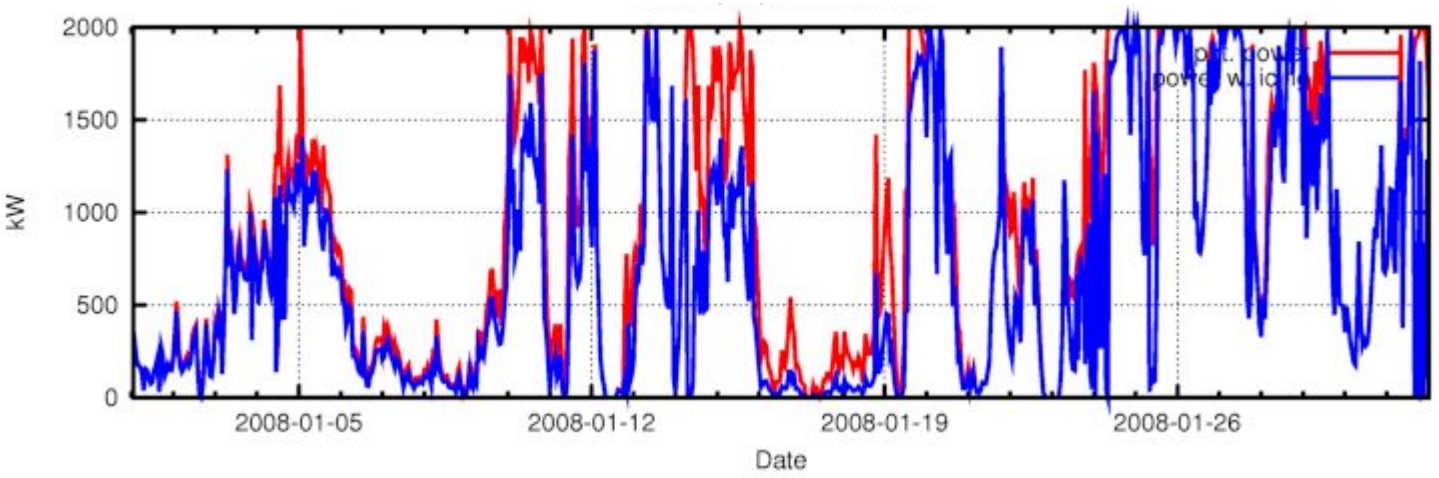


Ice load Glötesvålen 150m January 2008



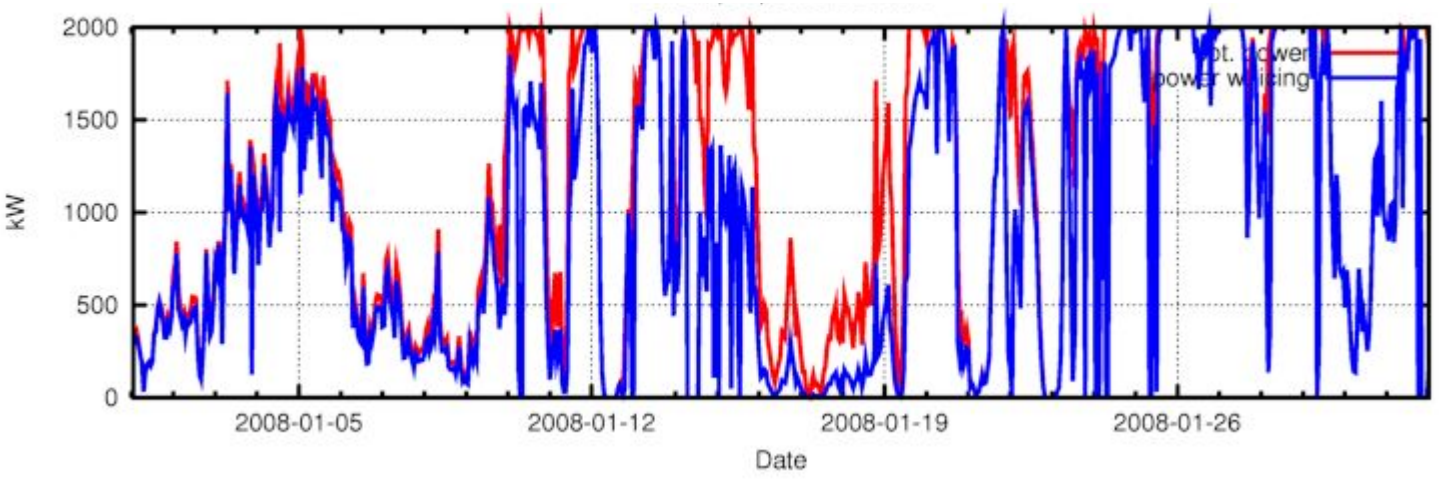
Products and examples

Potential and iced power prodution Glötesvålen 100m January 2008



Production ideal:
659 MWh
Production ice:
520 MWh
Production loss: 21%
Icing hours: 419 h

Potential and iced power prodution Glötesvålen 150m January 2008



Production ideal:
863 MWh
Production ice:
681 MWh
Production loss: 21%
Icing hours: 407 h

Thank you

Any questions?