

Highlights from the MetCoOp project 2011- 2014 *still developing...*

**Meteorological Co-operation
on Operational NWP
(numerical weather prediction)
*a co-operation between
SMHI & MET Norway***

Solfrid Agersten

August 2011 at SMHI, Kick-off for the project



MetCoOp project

Vision:

Deliver the best
short-term weather forecast
for common areas

Strategy:

Co-operation between
SMHI and met.no

Background

- ❑ Global models have an increasing quality...
- ❑ Running the “same” domain at SMHI & MET Norway
- ❑ Have co-operated in different areas
- ❑ Be stronger together
 - Side-effect *hope*: co-operation on different areas than NWP also...

Co-operate on sharing HPC resources

□ Start in 2014:

➤ Vilje (Norway)

➤ Byvind
as backup

□ Every ~2. year
new HPC

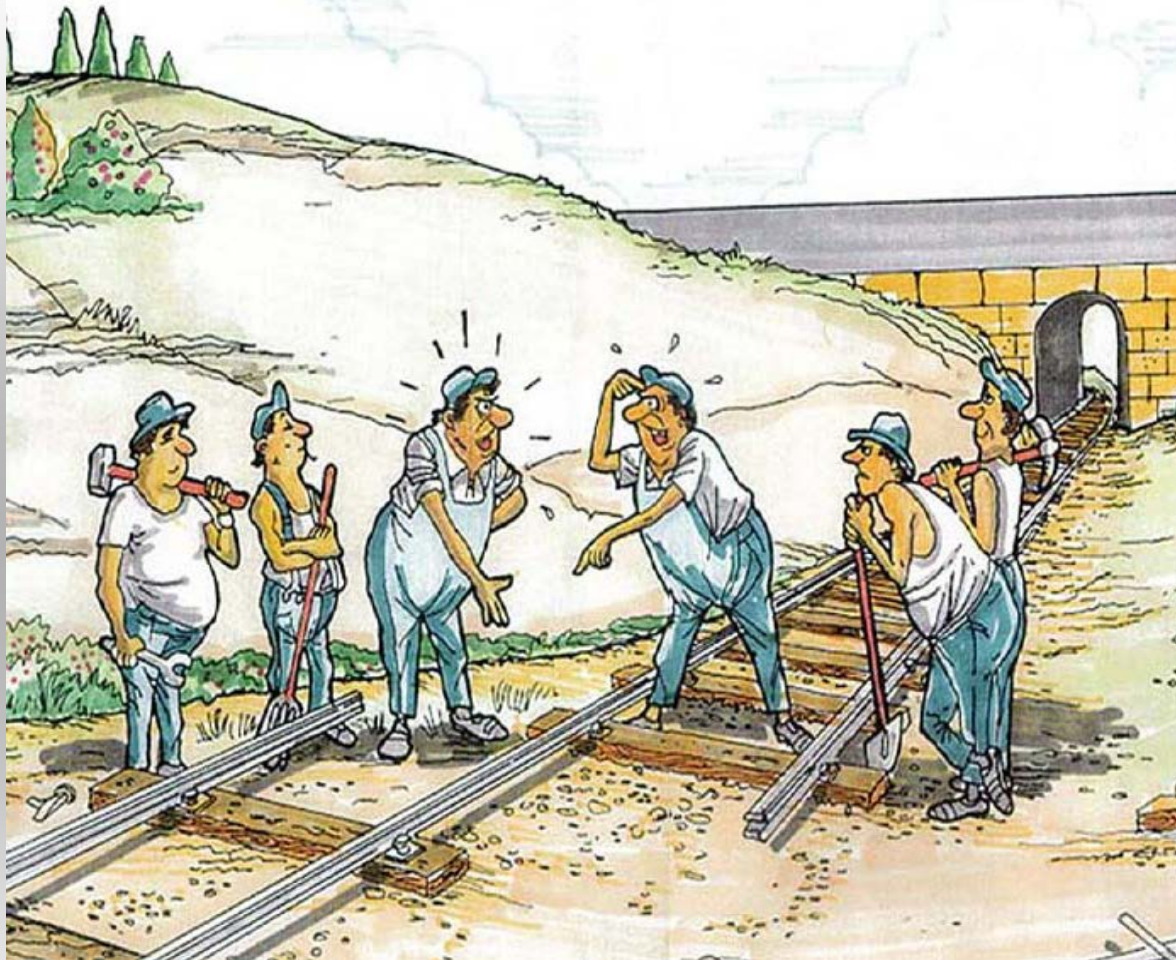
➤ Next procurement SMHI, accessible in
2015. Benchmark is out...



Project Scope:

Prepare for an
operational organization
on NWP production
from March 2014

Team Work



"None of us is as smart as all of us ."

-- Ken Blanchard

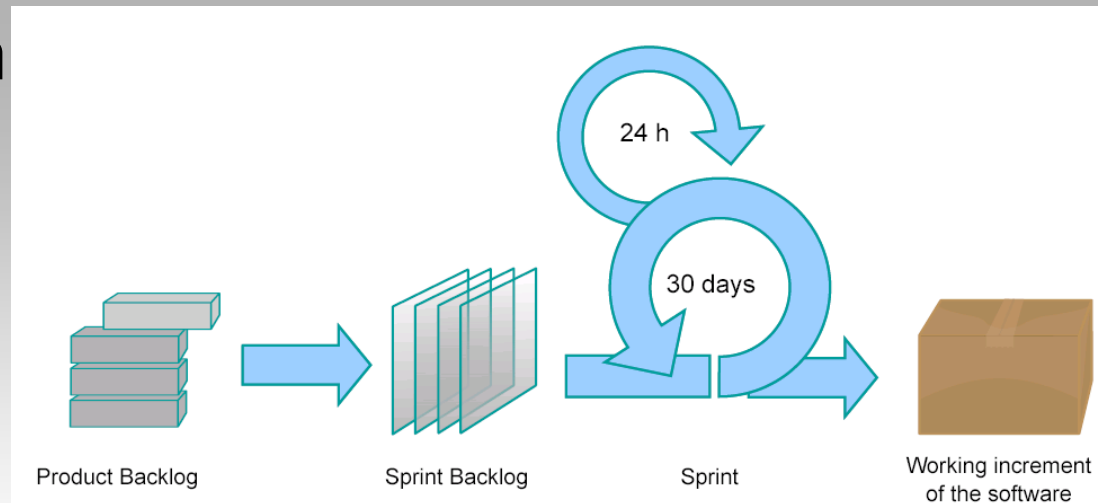
Project management

- ❑ Use of Scrum, Agile method
- ❑ Sprint review after every sprint
- ❑ Sprint planning before every sprint
- ❑ Twice a week
 - Scrum-meetings on video, Skype
 - Work together in project room
- ❑ Mix of model developers, model operators and IT – persons

Scrum project management

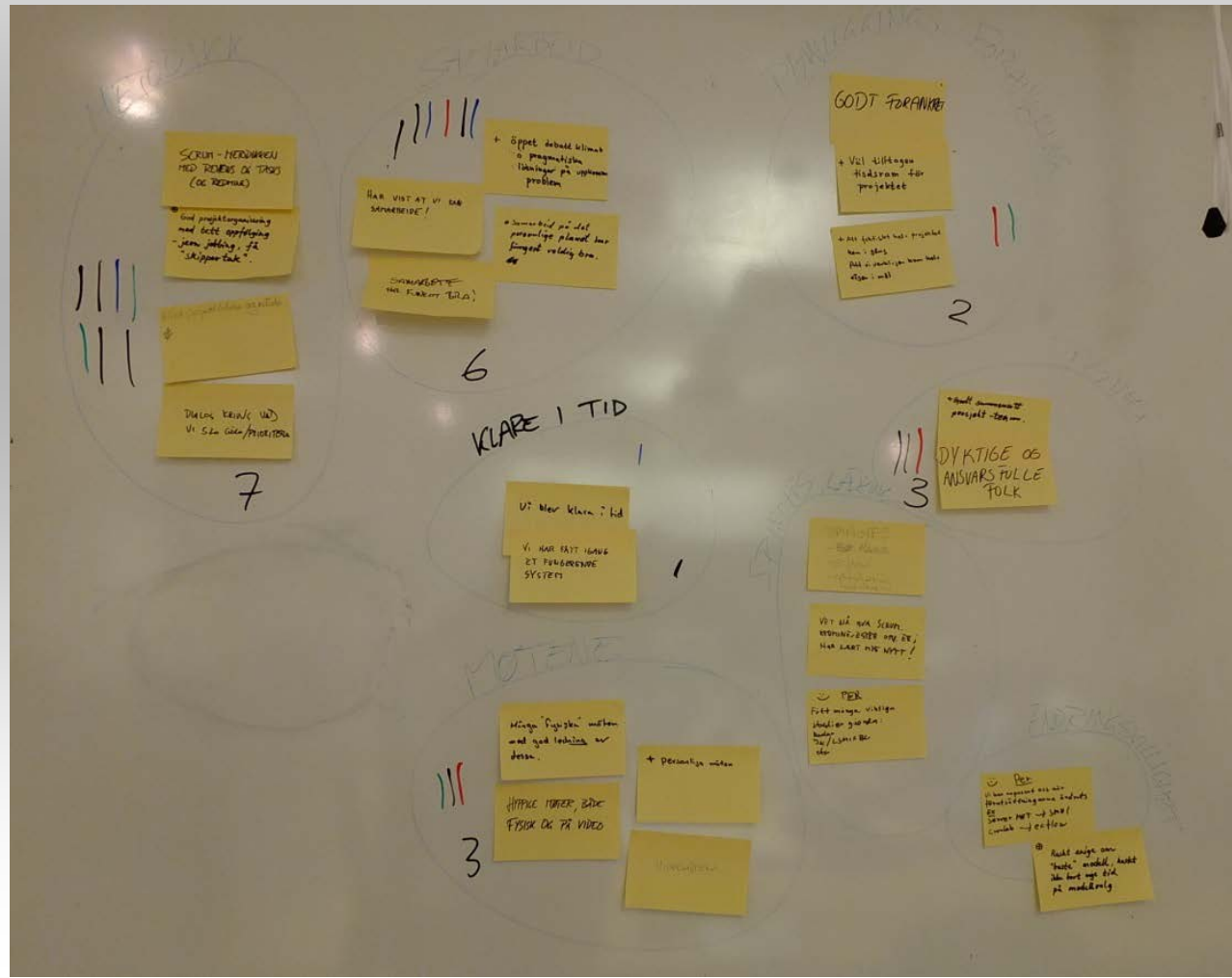
□ Gain progress in small steps

- Communication
- Empowerment
- Achieving velocity
- Having a vision

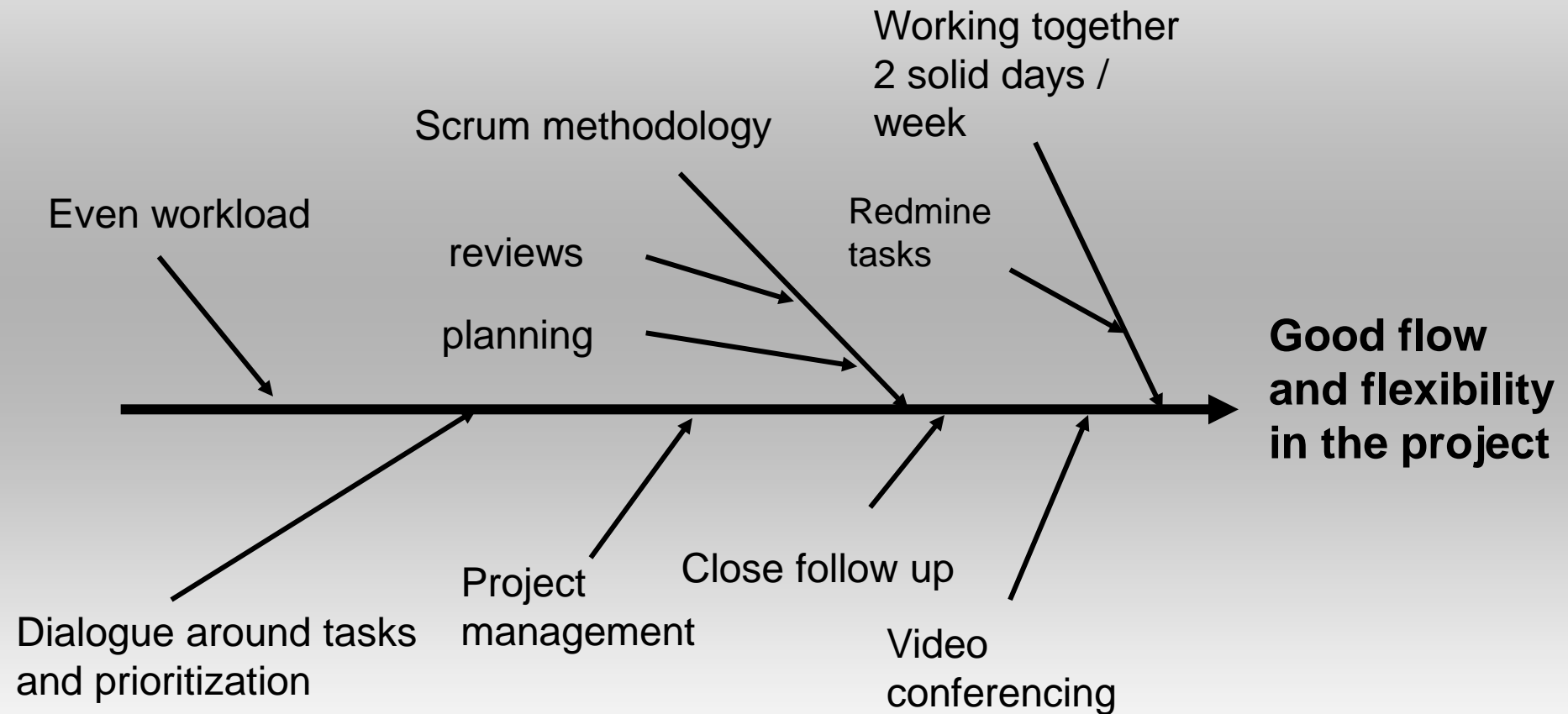


Post mortem analysis

The positive aspects of the project categorized on the white board.

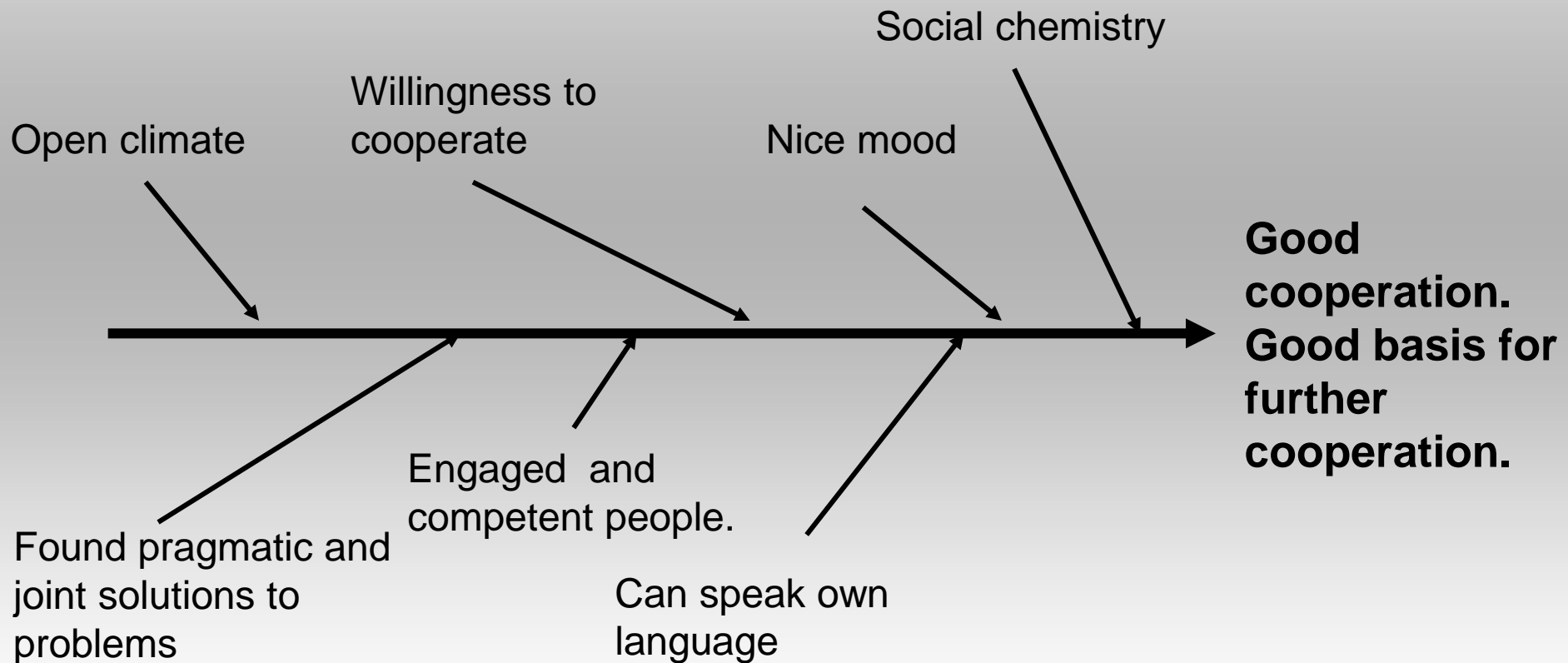


Project retrospect on methodology

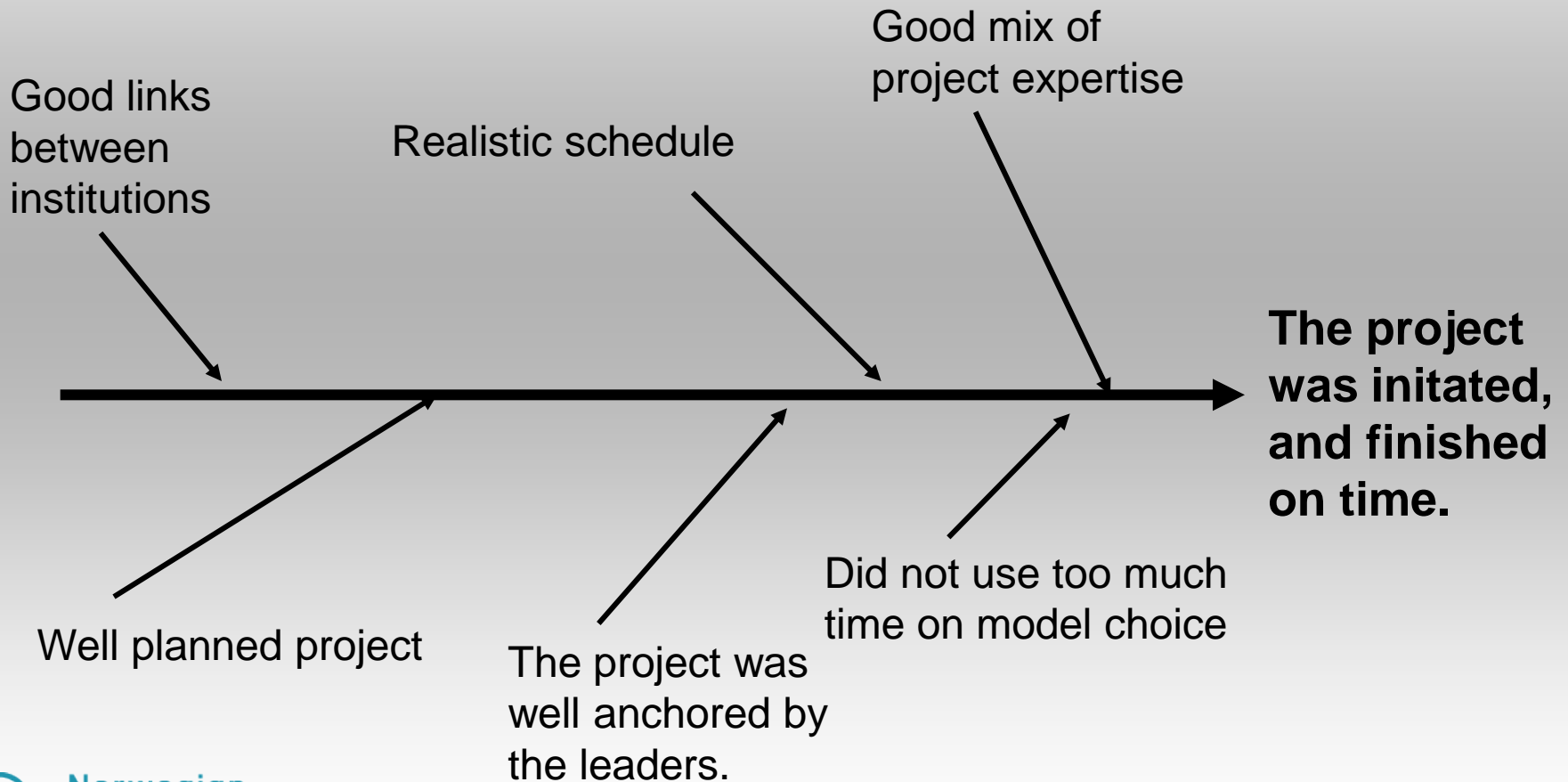


NEG: few work-shops, and too separate swedish and norwegian team.

Project retrospect on Co-operation and team



Finished in time



SMHI 18 March 2014



Milestones

- ❑ Decide common model-system 09-11
- ❑ Decide scheduler system 03-12
- ❑ Provide verification result 06-12
 - final decision and paper 10-12
- ❑ Decision about EPS system 10-12
- ❑ Pre-operational model setup 06-13
- ❑ Operational organisation 11-13
- ❑ Common operations from 03-14

18 requirements

□ Many evaluations

➤ PROS and CONS

- What is good/not so good with existing solutions
- How do we want this to work in the co-operation

➤ Give a recommendation

➤ Decision

□ Wiki pages with req. and sprints etc



Requirements...

- ❑ Optimal selection of **observations**
- ❑ Common operational deterministic **model system**
- ❑ System for **verification** and **model diagnosis**
- ❑ Common ensemble prediction system (**EPS**)
- ❑ Communicate with **users** and have system for feedback

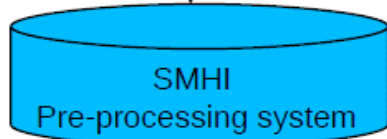
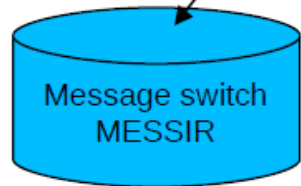
Requirements...

- ❑ **Test-procedures** (meteorological requirements)
- ❑ **Routines for change** (IT-technical)
- ❑ **Archive** of NWP output
- ❑ IT-infrastructure, sufficient **transfer capacity**
- ❑ Adapt to new **HPC resources**
- ❑ Documentation and publish results in proper **papers**.

Observations & pre-processing

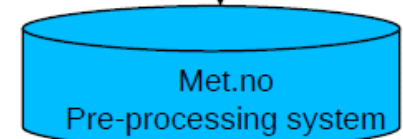
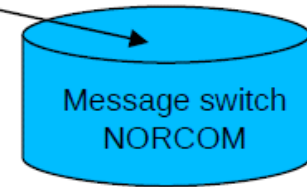
GTS – SYNOP, SHIP, DRIBU, TEMP/PILOT, AIRCRAFT (amdar,airep, acars etc)

SMHI



obs-file (ready for NWP)

Met.no



obs-file (ready for NWP)

Common MetCoOp Linux server



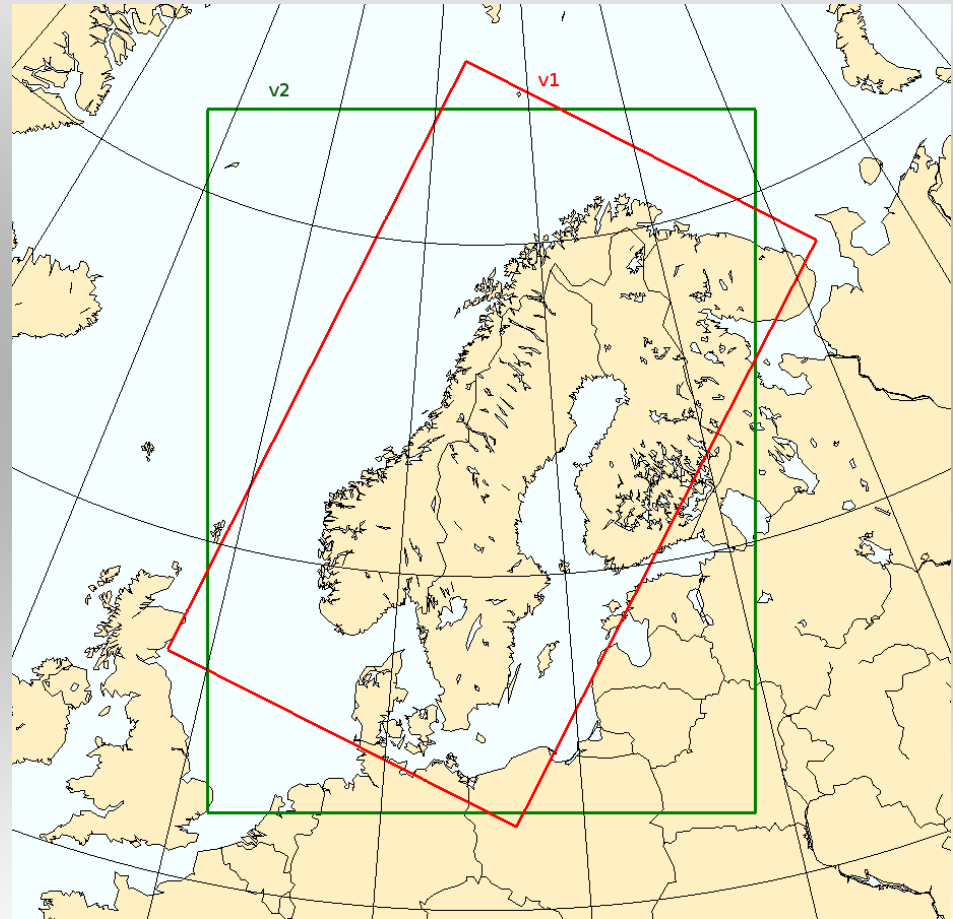
Norwegian
Meteorological
Institute

MetCoOp

SMHI

HARMONIE 2,5 km with Arome physics

- Higher resolution
- > smaller
domain...



Milestone (10-2012): Verificationstudy

1. ECMWF (~16 km)
2. HIRLAM (G05)
3. UM 4 km (MET)
4. HARMONIE AROME 2,5 km – MetCoOp

METCOOP MEMO 01/2012

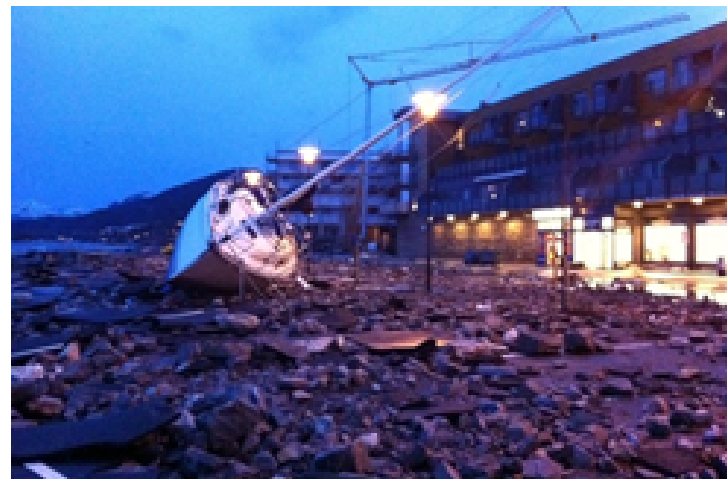
Published on <http://metcoop.org/memo>

38h1b3 vs ECMWF	Domain	Norway			Sweden			Whole		
		2011- 08	2011- 12	2010-11	2011-08	2011-12	2010-11	2011-08	2011-12	2010-11
Param:	statistic method									
Rh2M	RMSE	0	+	0	-	0	0	-	+	+
10m wind	RMSE	+	+	+ +	++	+	+ +	++	+	+ +
	FB	-	0	0	+	+	+	+	0	+
	ETS 8	-	0	-	0	+	+	+	+	+
	ETS14		--	--		+			-	-
Prec 12h	BIAS	-	+ +	+	0	-	0	-	-	+
	FB	+ +	+	+ +	+	0	0	+ +	+	+
	ETS 0.3	+	+	+ +	+	+	+	+	0	+
	ETS 3	0	0	0	0	0	+	-	0	0
	ETS 10	-	0	+ +	-	+	0	-	0	0
T2M	ETS	+ +	+	+	0	-	-	+	0	-
	RMSE	+ +	-	0	+	-	-	+	-	-
TCC	BIAS	0	-	0	-	-	--	-	-	-
	FB	--	--	--	-	0	--	-	-	--
	ETS	--	-	-	-	-	--	-	-	--

An operational view on HARMONIE AROME for MetCoOp

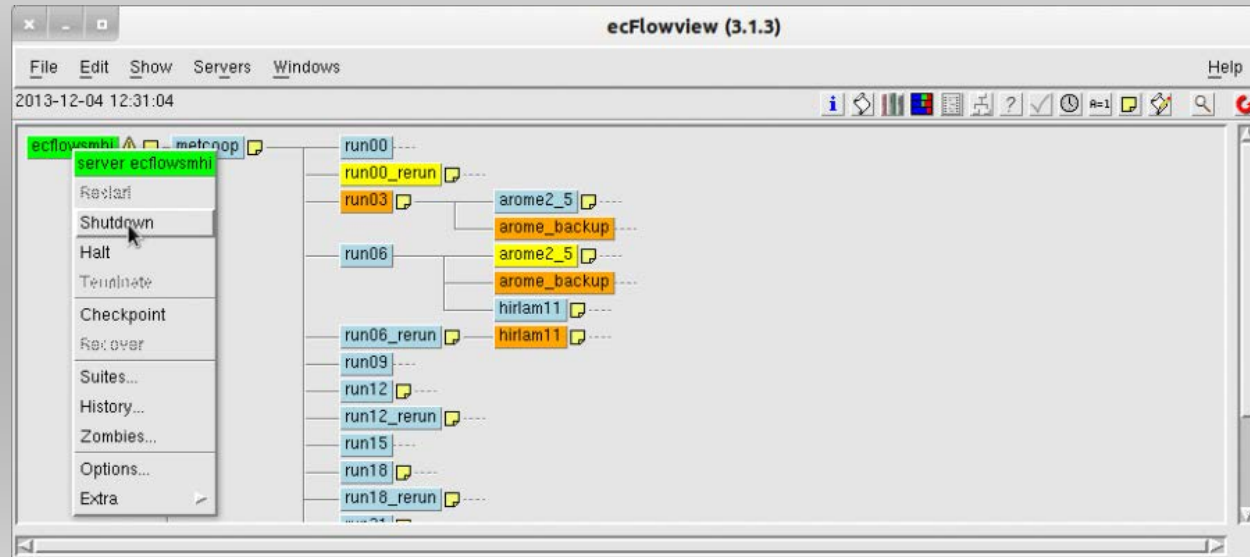
A case based study of cycle 37 and 38

Bjart Eriksen, Anne Mette Olsen, Erik Samuelsen, Solfrid Agersten, Ole Vignes



Milestone (06-2012): Job scheduling system

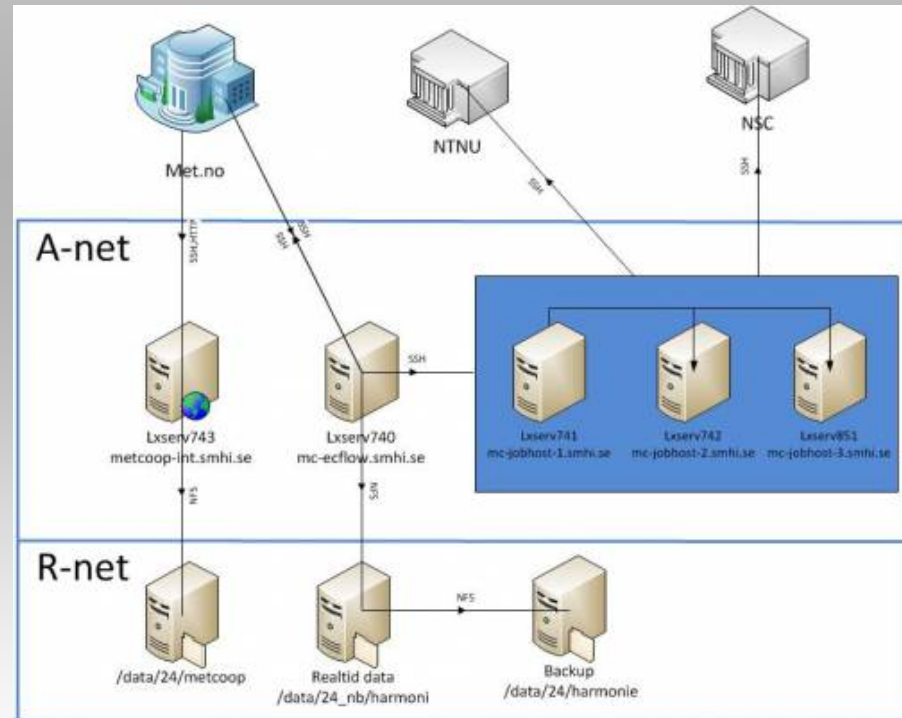
- ❑ Scheduler model runs and programs
- ❑ Monitoring



- ❑ Evaluation of ControlM, SMS + +
- ❑ Decision for ecFlow (from ECMWF)

Some decisions

- ❑ MetCoOp got own WMO center number (251)
- ❑ IT-infrastructure servers at SMHI
- ❑ Separate short term archive



IT – co-operation in practice

- ❑ To little knowledge about the use of server development / test / prod
- ❑ Some slow processes i.e.
 - Hard to get the necessary permissions (to servers/file-systems)
- ❑ Underrated need for IT resources from SMHI

SMHI

MetCoOp

ecFlow jobhosts på SMHI

Conv -observations

EC- boundary

Radar data

ATOVS data

IASI data

Conv -observations

EC-boundary

Radar data

ATOVS data

IASI data

MET

Merge and pre-processing

Post job

HPC – secondary

- Assmilation
- Run model forecast
- Write output

Trigger get job at SMHI

Trigger get job at MET

Post job

HPC – primary

- Assimilation
- Run model forecast
- Write output

File-server
(data24)



SMS
gets and
puts the
result

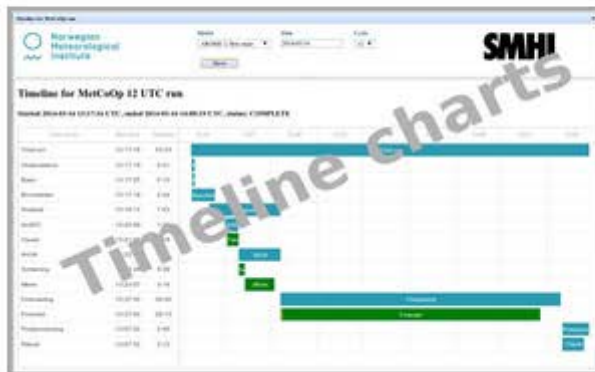
File-server
(opdata)

MetCoOp web-tools

<http://metcoop-int.smhi.se/>

The screenshot shows the 'MetCoOp Wiki' page with a sidebar on the left containing navigation links like 'System overview', 'System/service-info', and 'Other important info'. The main content area is titled 'System overview' and includes details such as 'System/service-info' and 'Other important info'.

The screenshot displays the 'Surface verification' tool interface. It features a 'LAST 7 DAYS' header, a 'Surface' dropdown menu, and a 'Type' section with options like 'Fc length var', 'Fc length var', 'Timeserie stat', 'Freq dist.', and 'Dayvar'. A 'Parameter' section lists 'U10m', 'Wind direction', 'T2m', 'Td2m', 'Rh2m', 'Q2m', 'Cloud cover', and 'Precipitation'. A 'Selection' dropdown is set to 'ALL'. Below, there is a comparison between 'Observation' and 'ECMWF' data, with a small line graph showing the results.



The screenshot shows the 'log files of HARMONIE cycle' tool, which displays a list of log files. The list includes file names such as '2014031218_006', '2014031218_007', and '2014031218_008'. The tool also provides a brief description of the files and their locations.



OBSERVATION USAGE MONITOR

Which ODB base to select from

- ECMA
- ECMA_SFC
- CCMA

What to plot? (NB! maps are "demanding")

Observation usage (map)

SYNOP

- u10m
- v10m
- t2m
- rh2m
- z
- snow

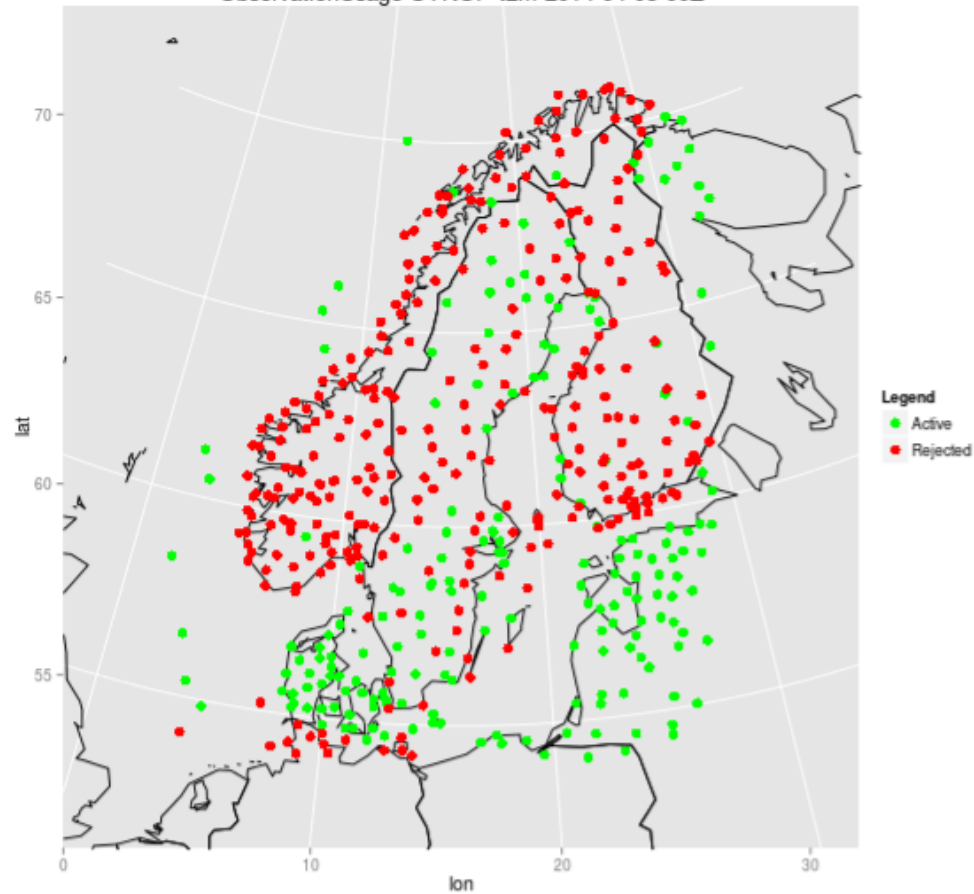
SHIP

- u10m
- v10m
- t2m
- rh2m
- z

AIRCRAFT

- u

ObservationUsage SYNOP t2m 2014-04-03 00Z



ObservationUsage SYNOP rh2m 2014-04-03 00Z



Runstatus

metcoop-int.smhi.se/monitoring/runstat/index.html

Google

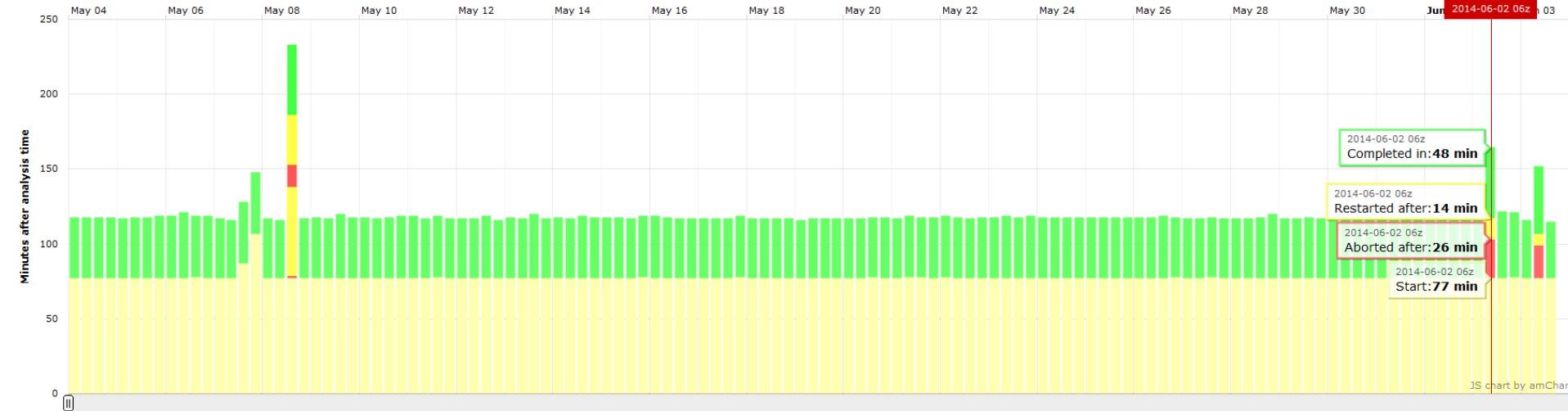
MetCoOp HPC runstatus



Host: Model: Cycles:

Start date: End date:

MetCoOp arome2_5_main start and run times, cycles 00/06/12/18, 20140504 - 20140603



Runtime live status

MetCoop models

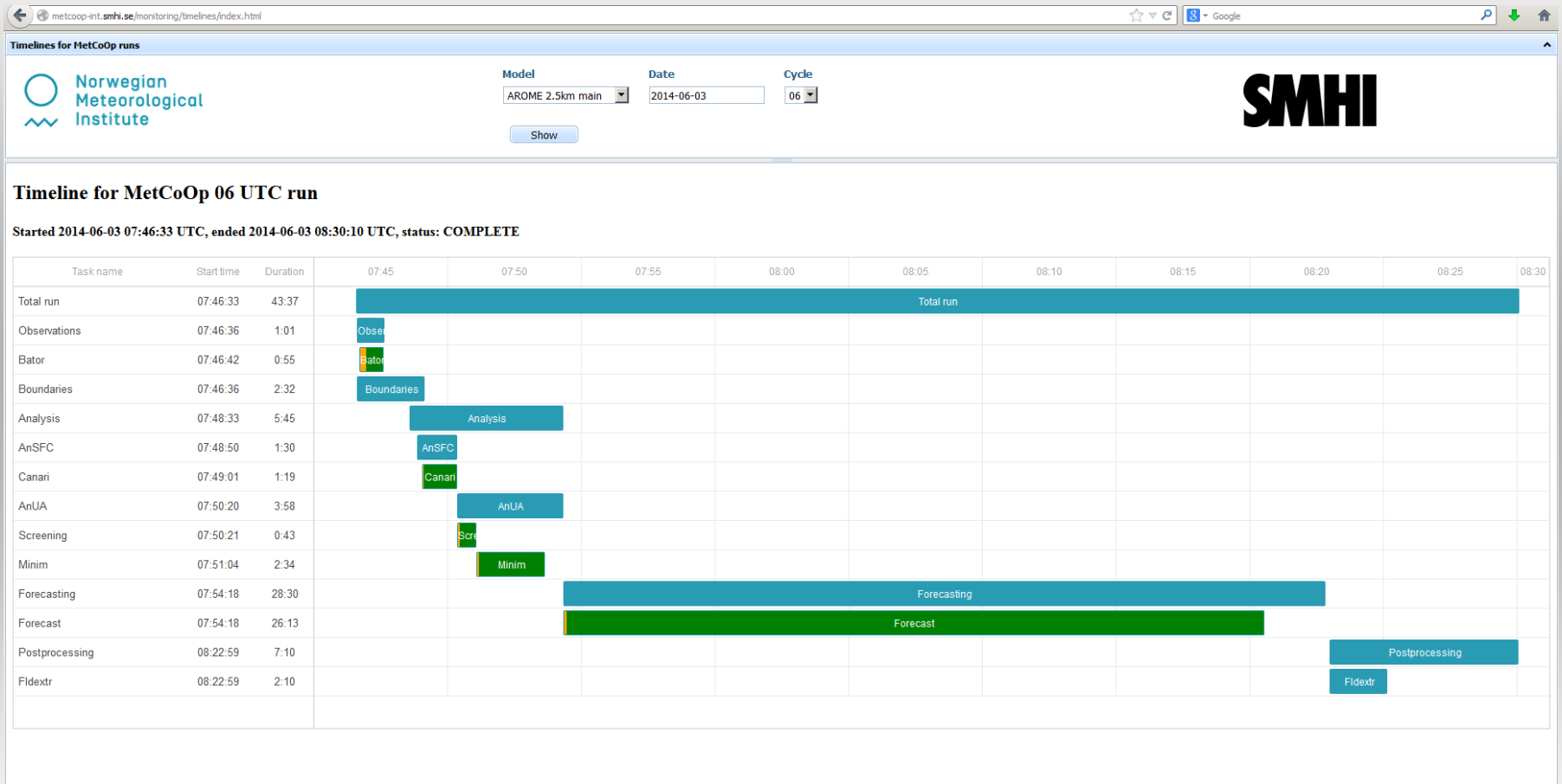
Today at 2014-04-03 19:52:16 Z

Model	Term	Date	HPC	Run Nr.	Start (UTC)	End (UTC)	Timestep	Status	Synops Land	Synops Ship	Dribu	Amdar	Temps Land	Temps Ship	DI
arome2_5	00	2014-04-03	Main	1	01:17:19	Unknown	66	Unknown	13902	2605	1988	47592	285	7	
arome2_5	00	2014-04-03	Backup	1	01:17:20	Unknown	48	Unknown	13902	2605	1988	47592	285	7	
arome2_5	06	2014-04-03	Main	1	07:17:12	Unknown	66	Unknown	15341	2690	1962	37118	24	0	
arome2_5	06	2014-04-03	Backup	1	07:17:16	Unknown	48	Unknown	15341	2690	1962	37118	24	0	
arome2_5	12	2014-04-03	Main	1	13:18:09	Unknown	66	Unknown	15186	2629	2092	46285	311	10	
arome2_5	12	2014-04-03	Backup	1	13:18:01	Unknown	48	Unknown	15186	2629	2092	46285	311	10	
arome2_5	18	2014-04-03	Main	1	19:17:48	Unknown	64	Unknown	14164	2537	1954	48360	21	2	
arome2_5	18	2014-04-03	Backup	1	19:17:32	Unknown	01	Unknown	14164	2537	1954	48360	21	2	

Archive 

Model	Term	Date	HPC	Run Nr.	Start (UTC)	End (UTC)	Timestep	Status	Synops Land	Synops Ship	Dribu	Amdar	Temps Land	Temps Ship	DI
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Timeline charts



hirlam.org/wiki

log files of HARMONIE cycle 2014060400

Files are ordered according to last modification time. Reference to [failed](#) jobs (if any) is at the end of this document.

- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Prepare_cycle_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Observations/Oulan_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/Boundary_strategy_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBC0/ExtractBD_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Observations/Bator_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/Prep_ini_surfex_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBC0/gl_bd_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC4/ExtractBD_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC2/ExtractBD_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC5/ExtractBD_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC6/ExtractBD_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC1/ExtractBD_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC3/ExtractBD_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC8/ExtractBD_1
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- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC9/ExtractBD_1
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- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC12/ExtractBD_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC18/ExtractBD_1
- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC19/ExtractBD_1
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- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC36/ExtractBD_1
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- /prod/cooper/work/harmonie/AM25_oper/AM25_oper/MakeCycleInput/Hour/Cycle/Boundaries/LBCn/LBC33/ExtractBD_1

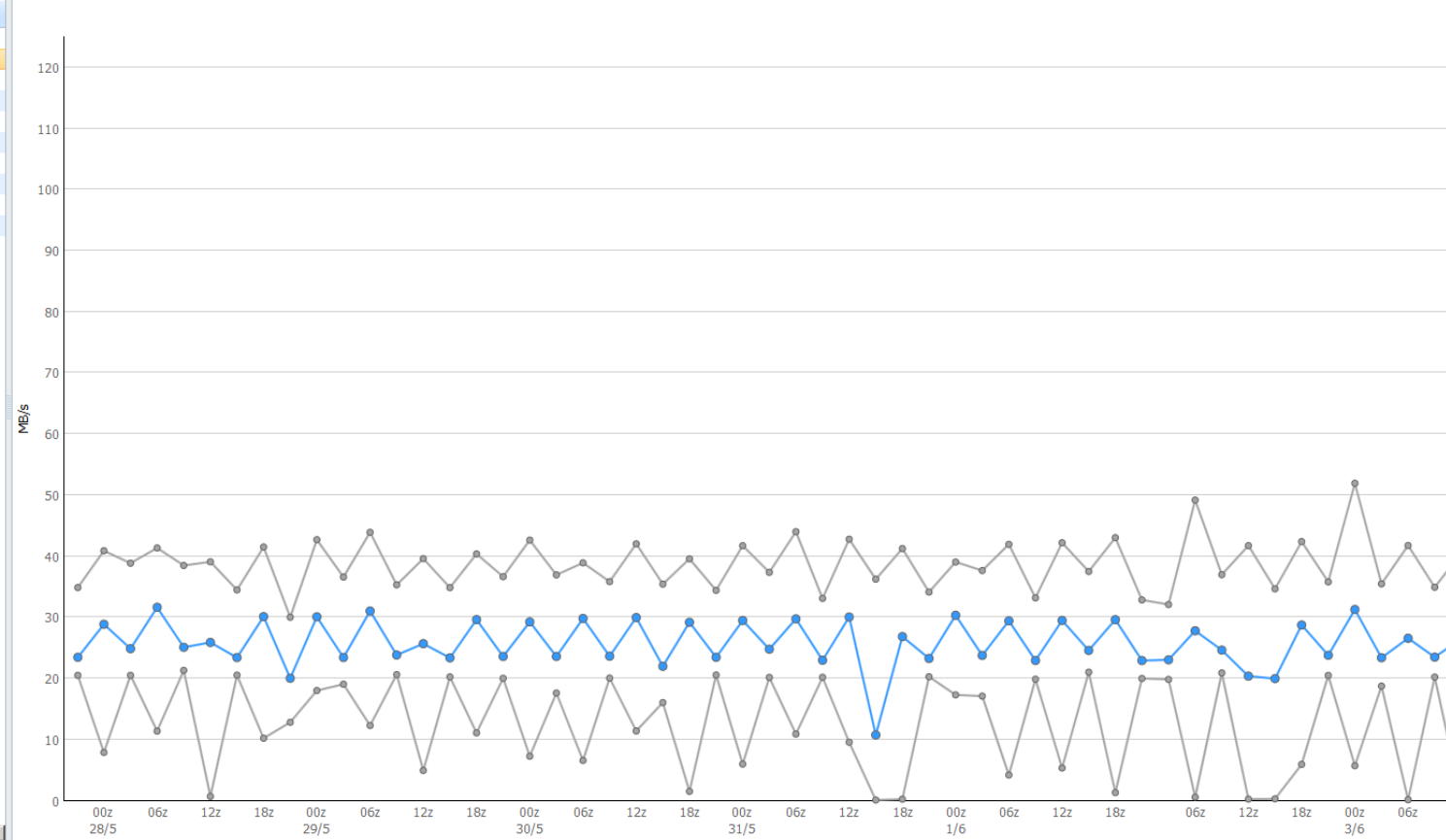
Average transfer rate from last model run

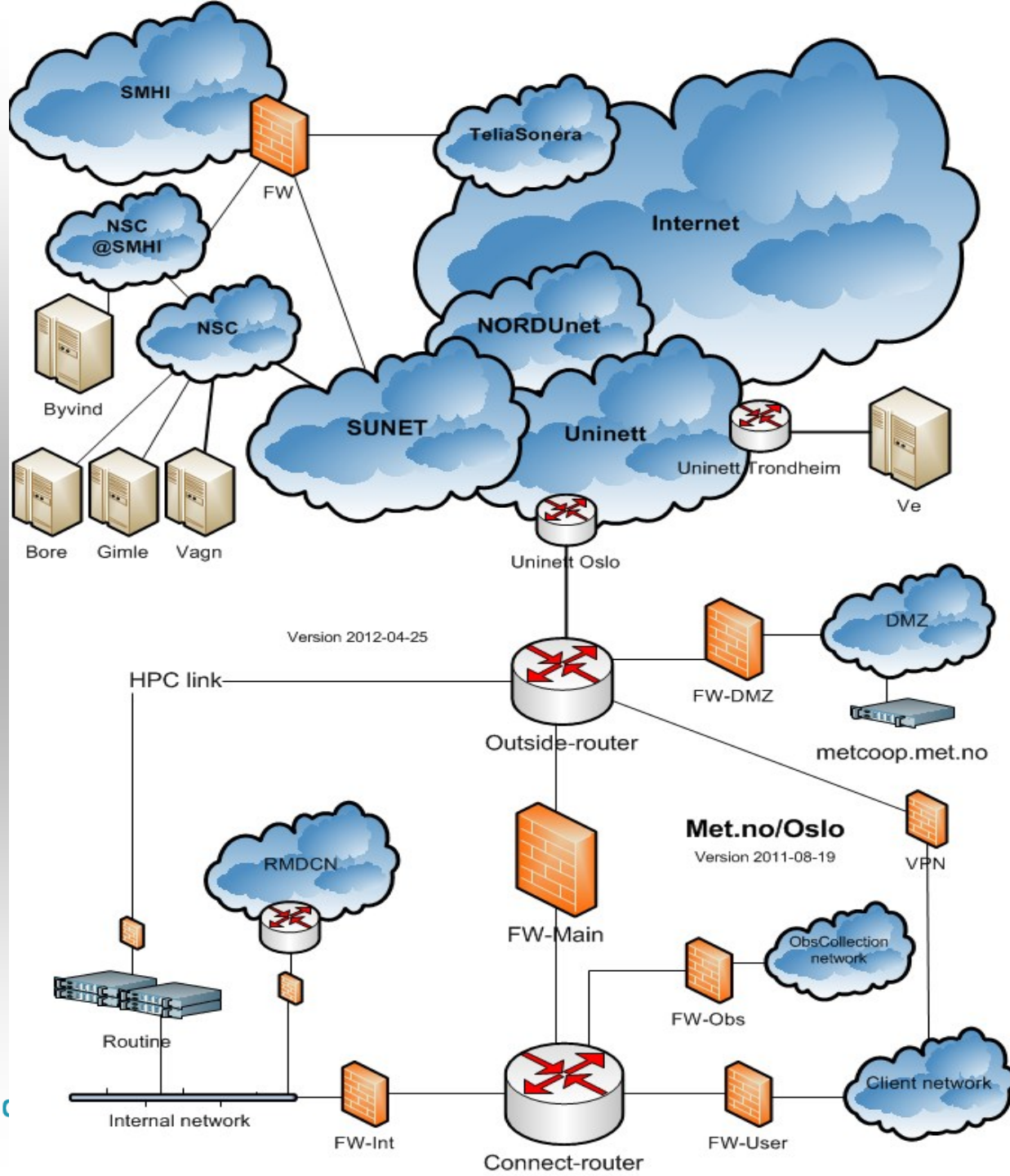


Select data source to graph

DATA TYPE	FROM	TO
AROME 2.5 main: model output	Vilje	SMHI
AROME 2.5 main: model output	Vilje	MET Norway
AROME 2.5 main: warmstart data	Vilje	ecFlow
AROME 2.5 main: bc, obs, warmstart	ecFlow	HPC
HIRLAM11: model output	Vilje	SMHI
HIRLAM11: model output	Vilje	MET Norway
AROME 2.5 backup: warmstart data	Byvind	ecFlow
AROME 2.5 backup: bc, obs, warmstart	ecFlow	HPC
AROME 2.5 backup: model output	Byvind	MET Norway
Check transfer rates (last week)	ecFlow	HPC
Check transfer rates (last month)	ecFlow	HPC

Average transfer rate per model run





RCR – HIRLAM reference center

□ HARMONIE AROME cycle 38

- 3 hour cycling
- ATOVS assimilation
- Soon including RADAR
- Sending monitoring files to hirlam.org
- Positive interaction...

User contact

- ❑ Meteorologists at SMHI meets MetCoOp operation every 4. week
- ❑ Monthly at MET (video conference)
- ❑ Logging experiences HARMONIE AROME

MetCoOp – operations - >

- ❑ 1-st line MET 7/24 – monitoring in case of incidents:
 - OP5 (Sweden), Nagios (Norway)
 - Ecfow - job scheduler
 - Ester – incident registrering
- ❑ 2-nd line at SMHI 7/24
weather model and IT -infra
- ❑ 3-rd line MET and SMHI
- ❑ Information routines MET-SMHI-NTNU-NSC

Documentation

□ 1.line documentation in dokuwiki

You are here: [MetCoOp](#) » [1.Line index](#) » [Conventional observations](#)



SMHI

1.Line index (MetCoOp)

Met Norway Operdoc

- Event log 1. line
- Planned events
- System overview
- Infrastructure
 - ecFlow scheduling system
 - HPC Hosts
 - MetCoOp servers
 - Network
- Model input
 - **Conventional observations**
 - Radar data
 - Satellite data
 - Boundary data
- NWP models
 - HARMONIE AROME 2.5 km
 - HIRLAM 11 km
 - HARMONIE EPS

Conventional observations

Table of Contents

- Conventional observations
- Service Description
- Routine Operation
 - Observations from MET Norway
 - Observations from SMHI
 - Merging
- Dependencies
- Monitoring
 - ecFlow tasks
- Operating Procedures
 - Notifications
 - Logging
 - Error Handling 1.line
- Tips and Tricks
- Event List
- Change requests

Systemname: Conventional observations

System owner: bo.strandberg@smhi.se

Priority: Priprod, Diamant

Updated: 2014/01/14 22:01

Updated by: TBD

Responsible: Lars Berggren

Approved date: 1970-01-01

Approved by: [Approved by](#)

2.line:

[Conventional observations, 2.line](#)

2.line contacts:

metcoop-2ndline@lists.met.no

Operations group: metcoop-op@lists.met.no

Keywords: [metcoop](#), [indata](#)

Doctype: 1.line

Alphabet: [C](#), [O](#), [I](#)

Service Description

Conventional observations are atmospheric measurements from surface stations: SYNOP, SHIP, DRIFT (drifting buoys), aircrafts and radiosondes. Data are distributed on the GTS and local pre-processing is done on both SMHI and MET. The observations are stored in the BUFR file format.

Change management

- ❑ Change order in “Ester”
- ❑ Plan a change(What, when and how)
- ❑ Different types of changes
- ❑ Decide which and when the change will be implemented
- ❑ Test (who and how long...)
- ❑ The operation needs to be further developed!

CHANGE

CHANGE TYPES & CATEGORIES

Standard

Normal

Urgent ?

Minor

Significant

Major

AUTORIZATION & APPROVAL LEVELS

Pre-authorized and pre-approved

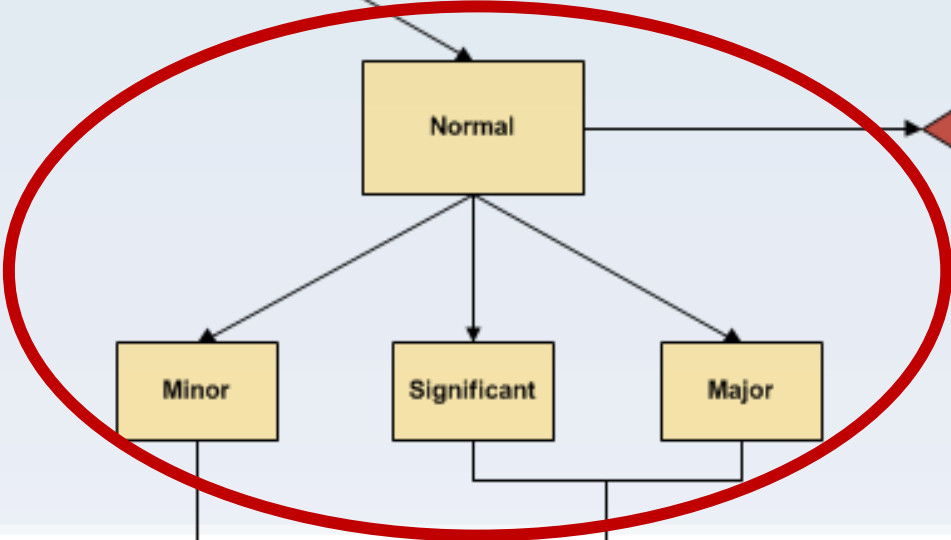
Authorization and approval by Change Manager

Autorisation by Change Manager

CAB approval

ECAB approval

GO/ NOGO?



Co-operation between researchers

□ Meeting February
2013

□ Different topics

➤ Temperature

➤ ATOVS

➤ Radar

➤ ...



Norwegian
Meteorological
Institute

Me

2014-02

HARMONIE AROME Change Notification

Change valid from: 2014-02-20 at 09 UTC

TYPE OF CHANGE	SPECIFICATION	RESULT/CONSEQUENCE
Server/IT		
Input data		
Model Update	cy.38h1.1 Official tagged version from HIRLAM. Active assimilation of ATOVS satellite data (with quite conservative use of channels)	No or minor changes technically and meteorologically for MetCoOp (since current version, cy38h1 rc1).
Post-processing		
Other:		

Additional information:

For more information about the official cycle 38 release of HARMONIE AROME see:

<https://hirlam.org/trac/wiki/ReleaseNotes/harmonie-38h1.1>

Verification results for impact of ATOVS data (summer 2011), see:

http://metcoop.met.no/verif/monitor_PD38h1b2_atovs_RR38h1b2_noatovs_metcoop_export/

Local change(s) at MET:

Local change(s) at SMHI:

Sender & date:

Ole Vignes and Solfrid Agersten, 19.02.2014

On behalf of MetCoOp

MetCoOp organization Development

(Morten Køltzow MET) The development of MetCoOp is responsible for improving the NWP model system.....

- ✓ Recommendations from;
 - ✓ Operations
 - ✓ Down-stream users,
 - ✓ HIRLAM-management group,
 - ✓ Externally funded projects,
 - ✓ Any other obligations

- ✓ Initiate and follow up different types of development processes this involves

*From description of
«MetCoOp organization»*

MetCoOp organization Development

MetCoOp Development projects:

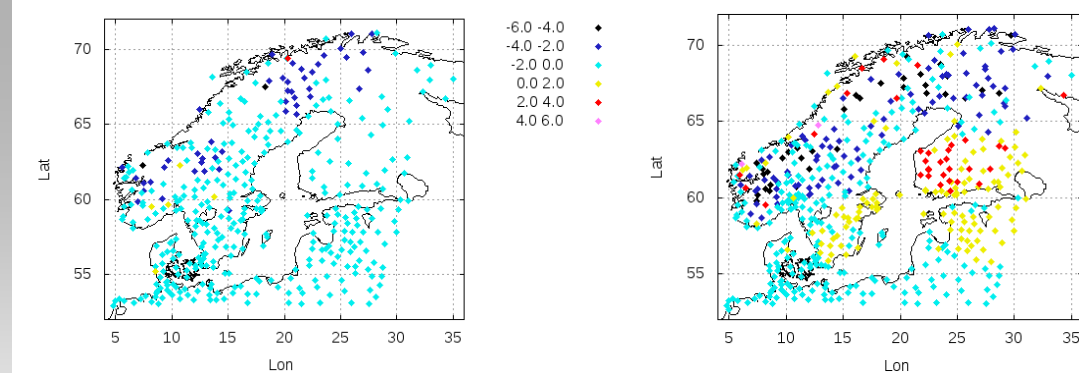
- ✓ Well defined specific projects
 - ✓ Model configuration/ development
 - ✓ infrastructure changes
 - ✓ IT-development
 - ✓ verification scores
 - ✓ etc..
- ✓ Staffing and duration depends on project
- ✓ All projects should include personnel with operational and/or IT experience
- ✓ (Duration has an) upper limit of 6 months

*From description of
«MetCoOp organization»*

What now?

- ✓ Finish development projects from the pre-operational phase of MetCoOp, i.e.
 - ✓ Assimilation of radar data, ATOVS and IASI
 - ✓ Observation monitoring
 - ✓ Daily verification set-up and Scorecard.

✓ Winter cold bias.



- ✓ Test and implementation of new cycles.
- ✓ High resolution EPS (2015).



The co-operation continues!

