Link with applications

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EWGLAM meeting Madrid, 20081006

- Applications using SR NWP models: a brief overview of the European zoo
- Why relevant in SRNWP context?
- Considerations of the ET

A very wide field…

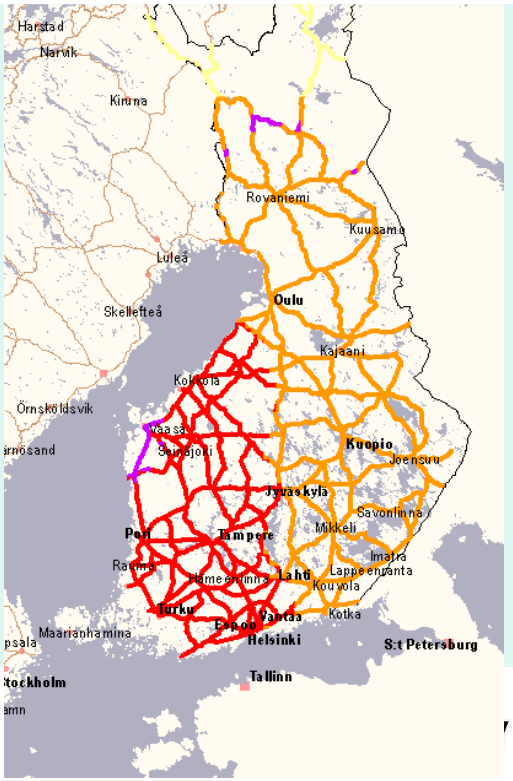
- Many application areas
- Using a wide variety of techniques (both deterministic and probabilistic)
- Involving potentially many types of expertise other than NWP (some “close” to NWP, others not)
- Many user communities with widely different characteristics (NWP knowledge) and interests
- Different levels of involvement of the NMS’s
- Types of use: non-profit or commercial?
- And so on…

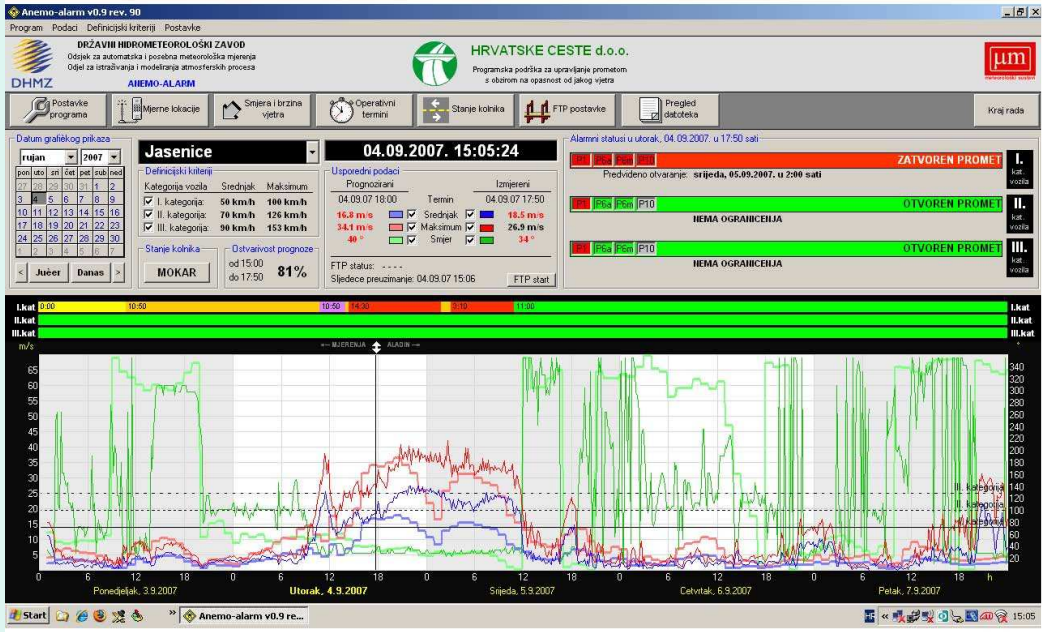
Hydrology

- Flood warning systems
- Drought conditions/ fire hazards
- River water levels for shipping
- Decision support systems for local water authorities
- Lake/river water temperature/icing conditions

Road conditions

- Relevant parameters: gusts, precipitation, road icing/snow conditions, visibility
- From DMO via 1D-modelling and statistical downscaling to coupling with detailed transport models





Energy

- Energy production forecasts for
  - Wind energy
  - Hydro-power
  - Solar power
- Weather info in support of oil/gas production
- Network load forecasting

Air quality

- Dispersion of toxic substances
- Trace gas concentrations in inhabited areas
- Summer and winter smog conditions

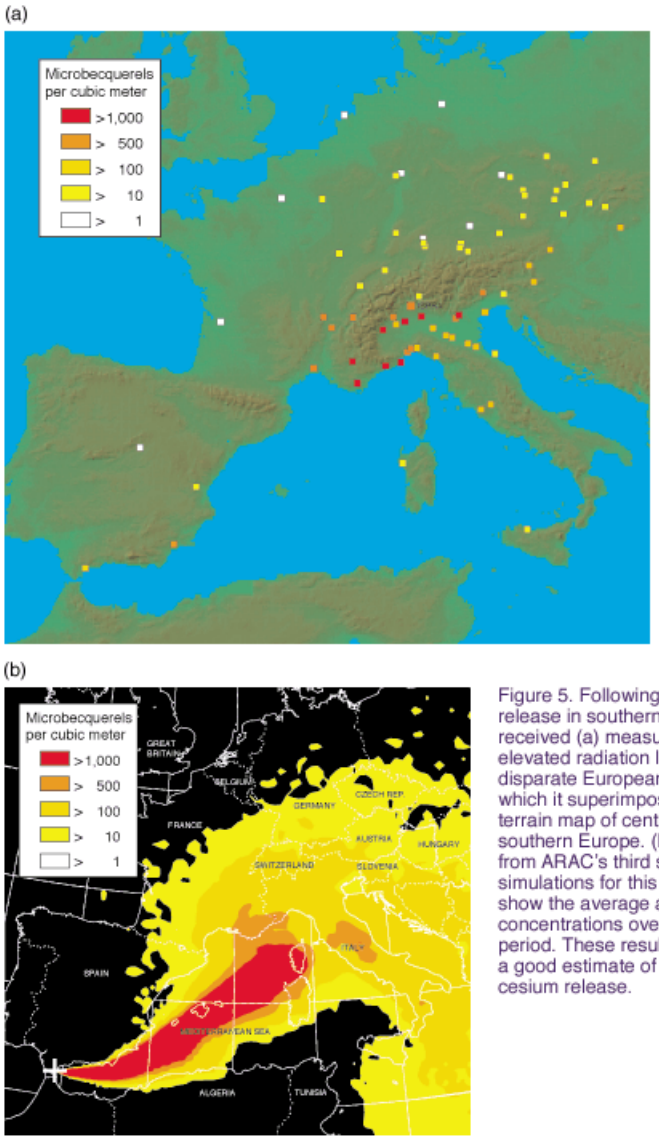
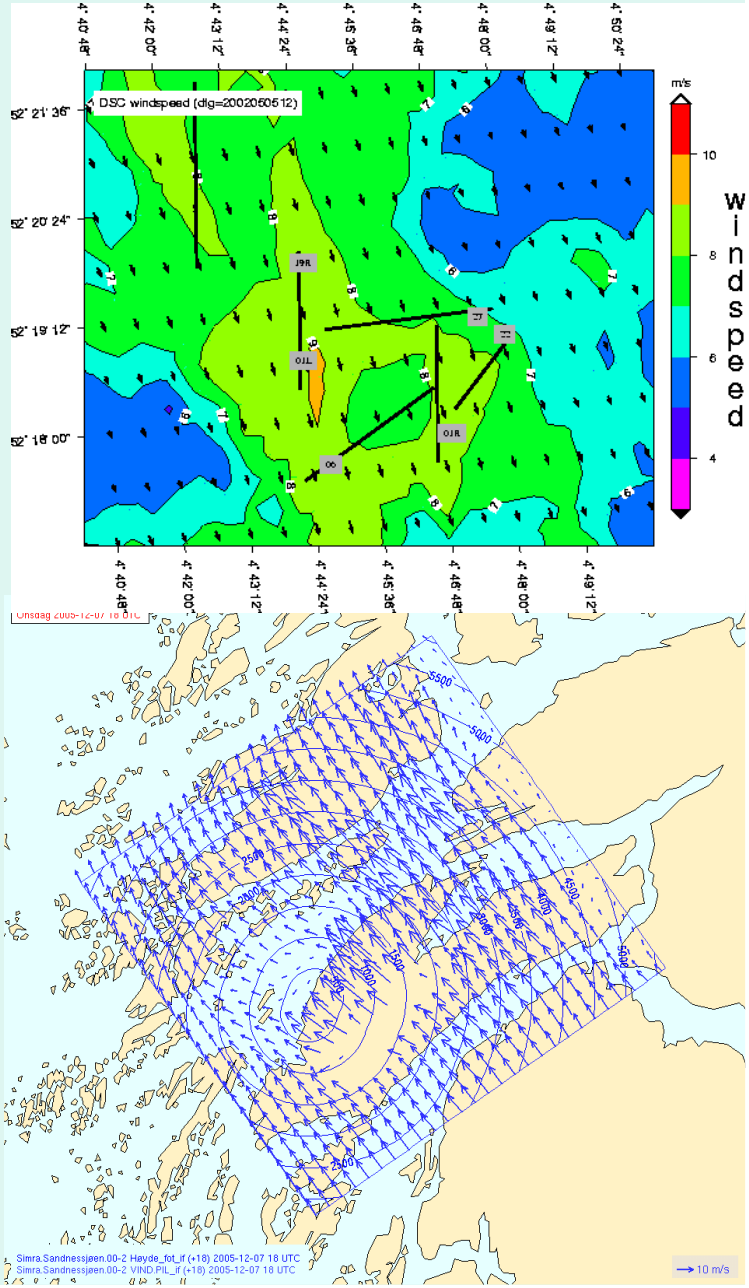


Figure 5. Following a cesium-137 release in southern Spain, ARAC received (a) measurements of elevated radiation levels from disparate European sources, which it superimposed on a terrain map of central and southern Europe. (b) Results from ARAC's third set of simulations for this release show the average air concentrations over a 7-day period. These results led to a good estimate of the original cesium release.

Aviation

- (Automated) production of routine METAR/TAF/TREND bulletins
- Nowcasting of visibility / gusts / severe convection
- En-route flight decision support (CAT, icing, volcanic plumes,…)
- Airport / airline management support systems



Maritime applications

- Storm surges and coastal protection
- Shipping safety: storms, surface waves, visibility, sea ice conditions, …
- Ship routing
- Information for fishing

Health

- Risk of smog / high PM concentrations
- Risk of heat waves
- Pollen / allergy forecasts
- UVB forecasts
- Water temperature and impact on water quality

Agriculture

- Risk of spread of foot and mouth disease
- Frost near the ground
- Seasonal forecasts

Many types of applications…

- Statistical postprocessing to improve NWP output: MOS, PPM, KF, adaptive bias corrections…
- Physical postprocessing:
  - Production of externally derived fields
  - Downscaling to local conditions
  - Downstream models for non-atmospheric aspects
- Nowcasting applications – coupling with observations (SAF's, INCA, …)

… but where does it all end?

An important “application” to consider, when it comes to severe weather?

Why relevant to SRNWP

- Ensure that SR NWP has/ retains committed end users
  - “Proven” value of SR NWP in end user applications = justification of efforts/means put into it towards funding authorities
- More effective application R&D through exchange of ideas/experiences/tools(?) on applications of common interest
- Feedback to SRNWP R&D:
  - items to improve in the SR NWP models
  - See where applications/products should become incorporated into NWP models somehow.

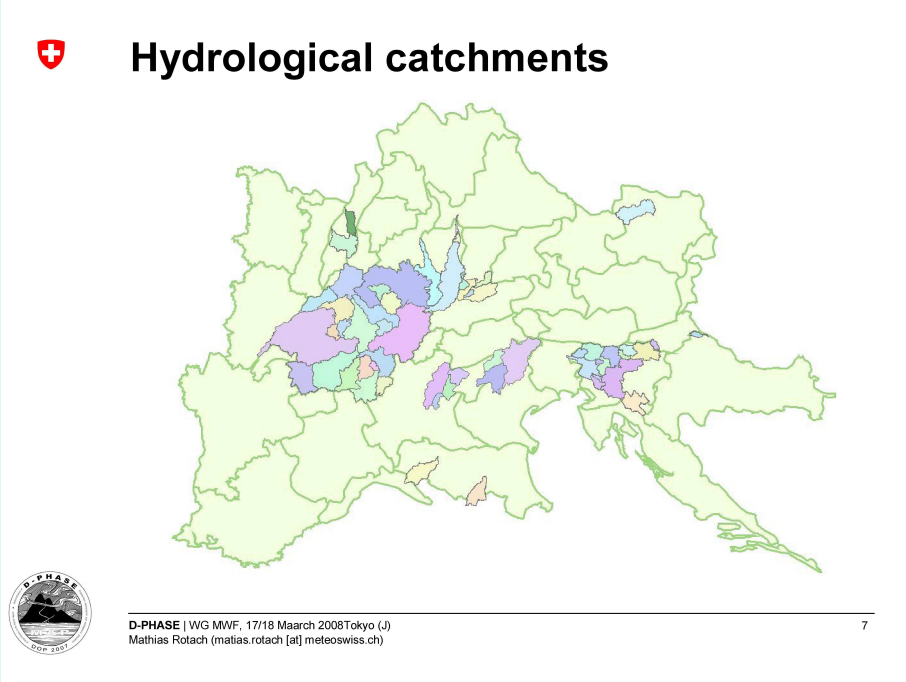
Deterministic versus probabilistic

Which has greater forecast value (in the eye of the beholder)?

- Deterministic information:
  - Is usually what users feel they need
  - Appears more “accurate” (more spatially detailed)
  - Appears (and sometimes is) more appropriate to use on the (very) short range
- Probabilistic information:
  - More difficult for end user to handle
  - To use optimally, requires insight into user’s decision process
  - More and more experienced users are beginning to understand the added value of uncertainty information
- Objective verification and communication of forecast value needed for both!

Value for users:
an example from hydrology (MAP D-PHASE)

- MAP D-PHASE: demonstration phase of MAP (2007)
- 23 deterministic atmospheric models, 7 ensembles, 7 coupled hydrological models
- Warning products at pre-agreed alarm levels for hydrological catchments in Switzerland
- Close contacts with hydrological user community during IOP and analysis phase



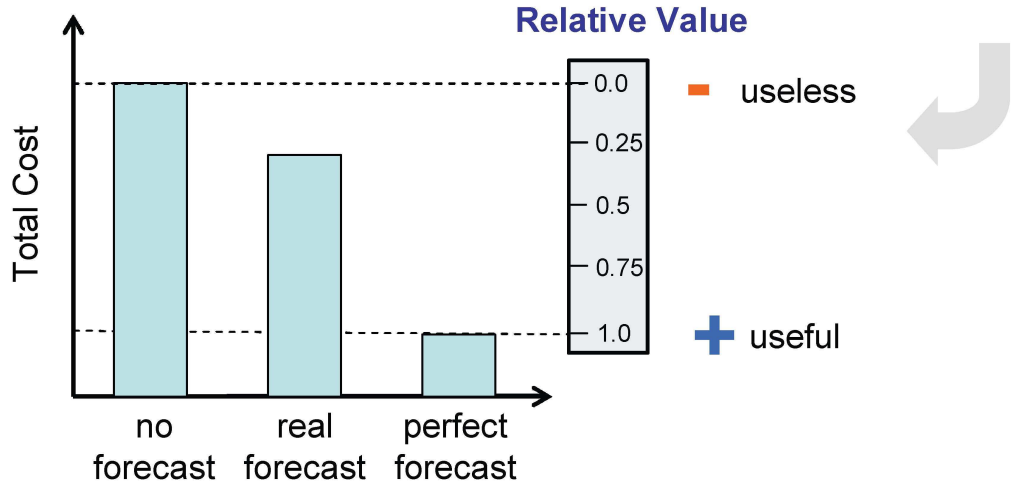
Concept of “Relative Value”

Economic point of view:

Precautions causes **C**osts

Having no protection results in **L**osses

Precaution \ Event	 Yes	 No
 Yes	C	C
 No	L	0



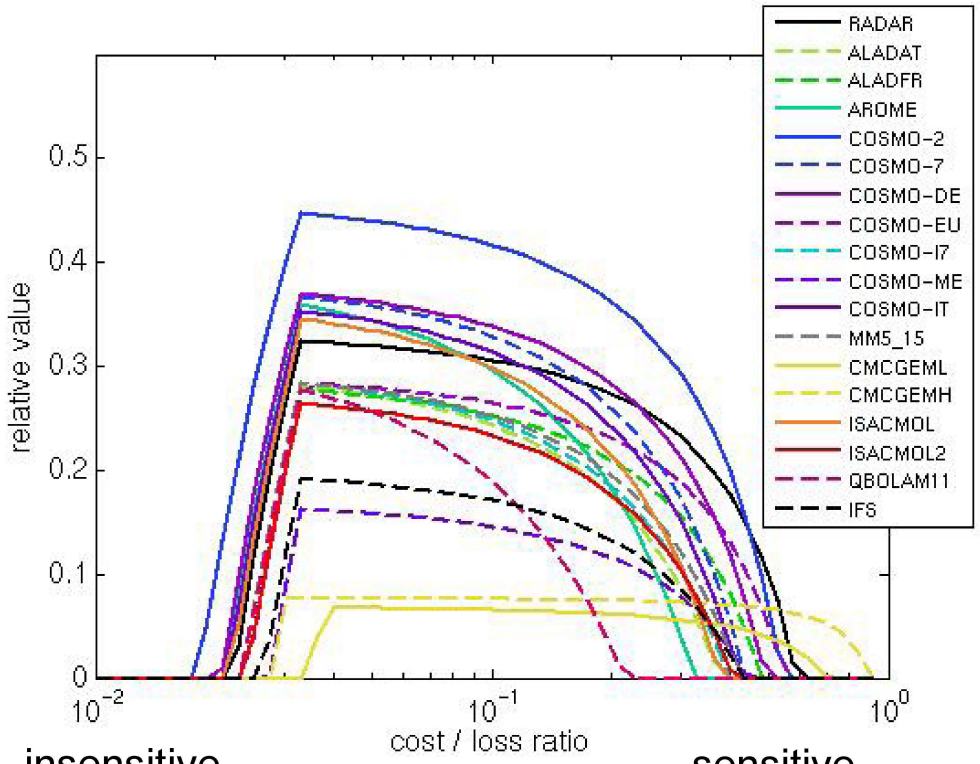
User-specific verification and determination of value

Relative value – Alert level „yellow“

(03h, 06h and 12h accumulations, cut-off +03h)

+ useful

- useless



insensitive … sensitive …

… against false alarms

User-specific products/verification

- Needed to “translate” NWP to user interests
- Essential for determination of value of information for end user
- But:
  - Requires “institutional” user
  - Requires intensive and regular contacts with user
  - Which users are important enough to merit specific treatment?
  - To what extent is user-specific verification on European scales possible?

Feedback for improvement of NWP

- Requirements for user-specific output to be incorporated in routine NWP postprocessing (e.g. gusts, RVR)
- Requirements for improving specific weather parameters (e.g. ddd for dispersion models)
- Helping users to find out what is possible and what they should be asking for (e.g. wind energy)
- Help decide where to incorporate specific PP/ applications into NWP

Existing cooperation

- In some application areas, extensive cooperation already exists (within EU projects, COST actions, SAF's, EUMETNET, …):
  - Hydrology
  - Air quality
  - High impact weather in general
- Some fields are relatively new (health)
- Some fields are generally considered commercial: agriculture, aviation, … But this does not necessarily exclude cooperation!

What are the consequences of this for cooperation in SRNWP context?

Dilemma’s/considerations for the ET

- How to make scope manageable? When are activities still within the remit of SRNWP, when not?
  - Where does postprocessing cease to be NWP?
- Cooperation in what?
  - Concentrate on NWP aspects only (feedback, value), or on applications themselves? If the latter, then focus on few areas?
  - Information exchange or application development?
  - Competition vs. cooperation: what is shareable?
  - Precompetitive or non-commercial applications only?
- Applications usually “organized” at national, not consortium level, and often by people outside NWP => how to get the right expertise / knowledge / permissions?
- Links with ET/verif activities?