FINNISH METEOROLOGICAL INSTITUTE

cost 731

QPF Verification in ~~Small~~ River Catchments with the SAL Measure

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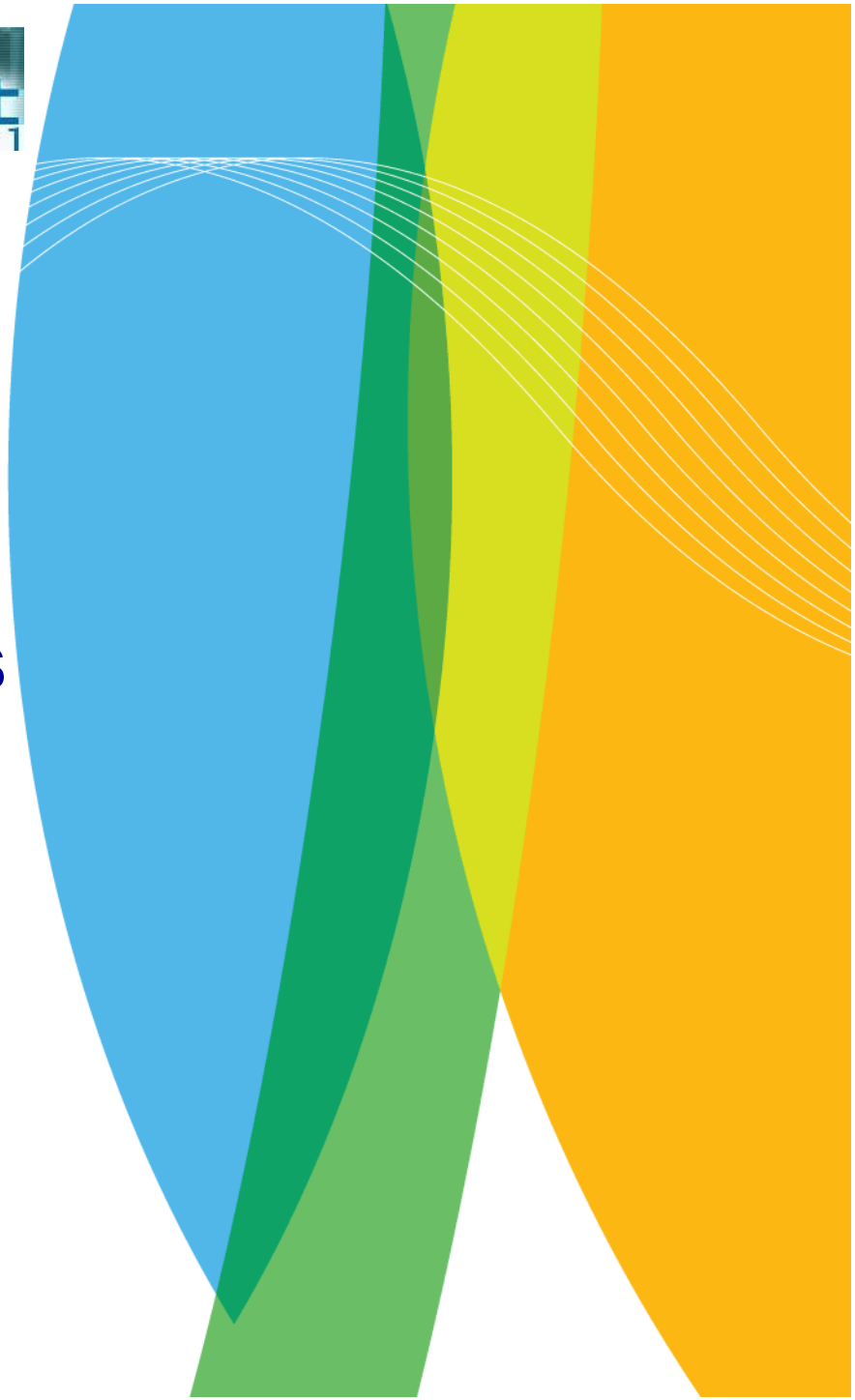
Joint MAP D-PHASE
COST 731 Mid-term Workshop
Bologna, 19-22 May 2008



Requirements

… for *optimal* spatial precipitation forecasts

- ✓ **Occurence vs. non-occurence should be forecast**
- ✓ **Location** *(displacement)* **predicted precisely**
- ✓ **Amplitude** *(volume)* **predicted correctly**
- ✓ **Structure** *(size and shape; pattern)* **and spatial variability predicted properly**

❖ **SAL ⇔**

- ✓ Entity-, Object-, Features-, Displacement-based family of verification measures (like CRA, MODE, …)
- ✓ **SAL Originator ⇔ Uni. Maintz / MeteoSwiss / DLR**
- ✓ *Software (Fortran code) available at FMI in mid-2007*

SAL features

- ✓ **QPF in pre-specified area ⇔ River / Lake catchment**
- ✓ **Three independent components addressing the quality**
  - **Structure - S -**
  - **Amplitude - A -**
  - **Location - L -**
- ✓ **For a perfect forecast: S = A = L = 0**
- ✓ More details of the method in

  Wernli, Paulat, Hagen, Frei, 2008 (MWR)

SAL features

		-2	…	0	…	+2
S:	**Structure**	objects too small or too peaked		Perfect		objects too large or too flat
A:	**Amplitude**	averaged QPF under-estimated		Perfect		averaged QPF over-estimated
L:	**Location**			Perfect		wrong location of Total Center of Mass (TCM) and / or of objects relative to TCM

What's the "truth"?

From precip observations to precip analysis

- ✓ Gauge data ?
- ✓ Radar data ?
  - ⇨ Used mostly in this study
- ✓ Merged Gauge-Radar data ?
  - *Would like to use, but…*
  - *Which methodology ???*

Observed "truth" ? ~ Uncertainty ?

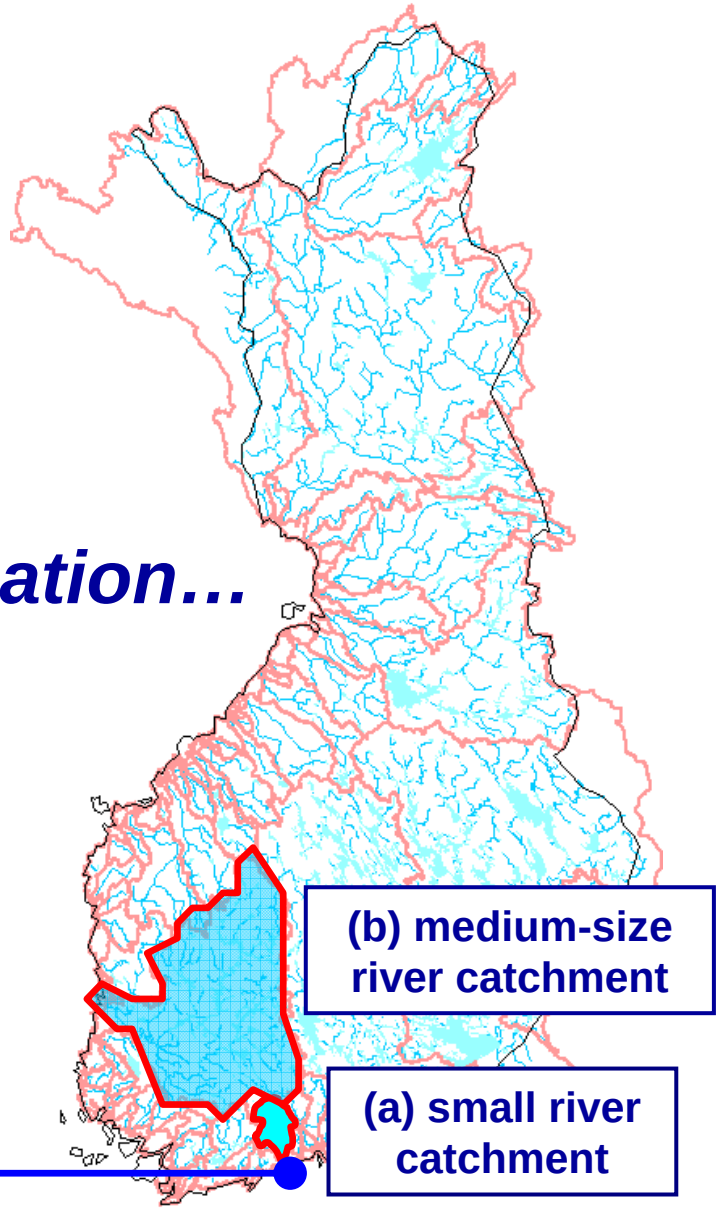
⇨ **Implications to verification !**

⇨ **Interpretation of the results !?!?**

SAL ⇔ Hydrology

Catchments areas in Finland:

⇨ ***Sub-domains for SAL verification…***



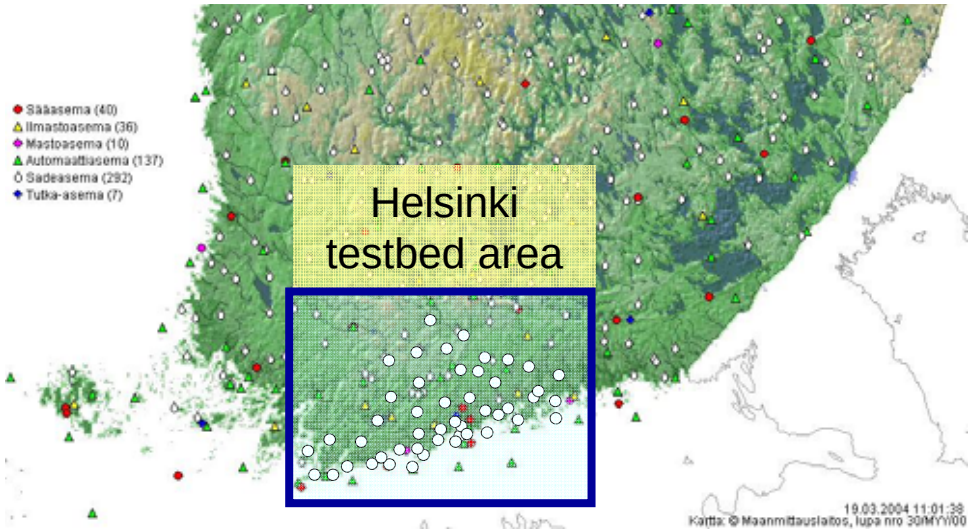
Forecast Data

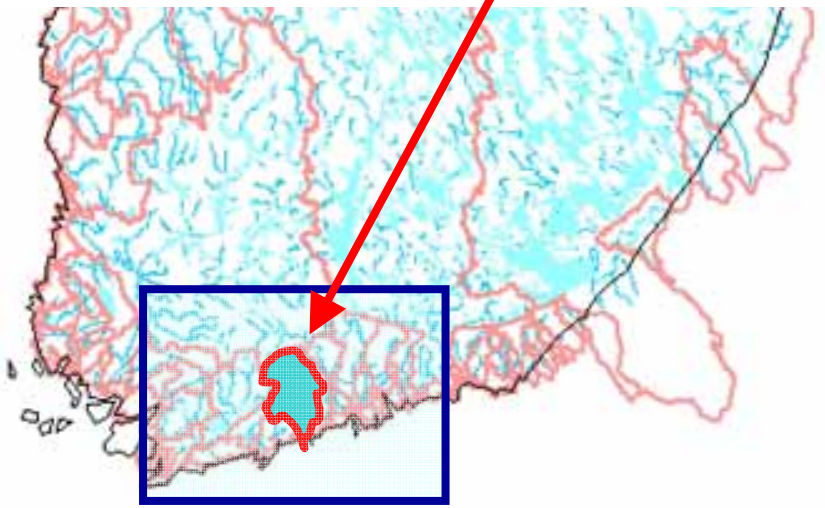
1. **ECMWF** QPF ~ 25 km
2. **HIRLAM RCR** (Reference) QPF ~ 16 km
3. **HIRLAM MBE** (MesoBeta) QPF ~ 7.5 km
4. **MetEdit** = Forecasters' grid edited QPF ~ 15 km

o **Radar QPE ~ 1 km**
o Gauge obs ~ ?

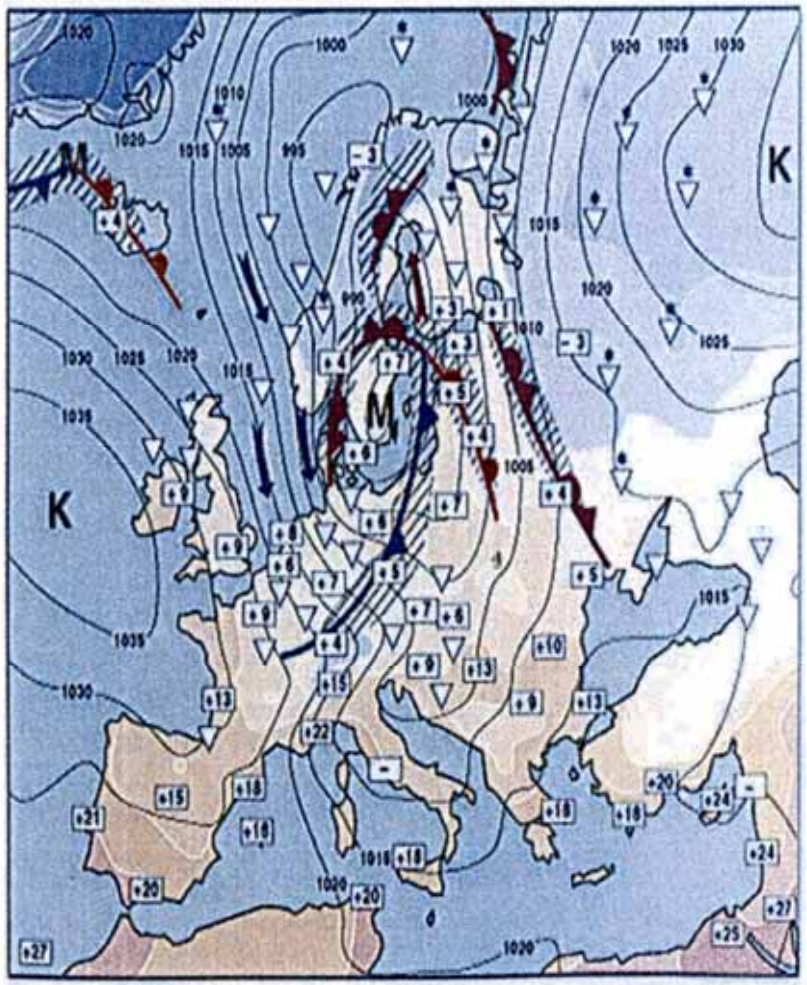
} **"Truth"**

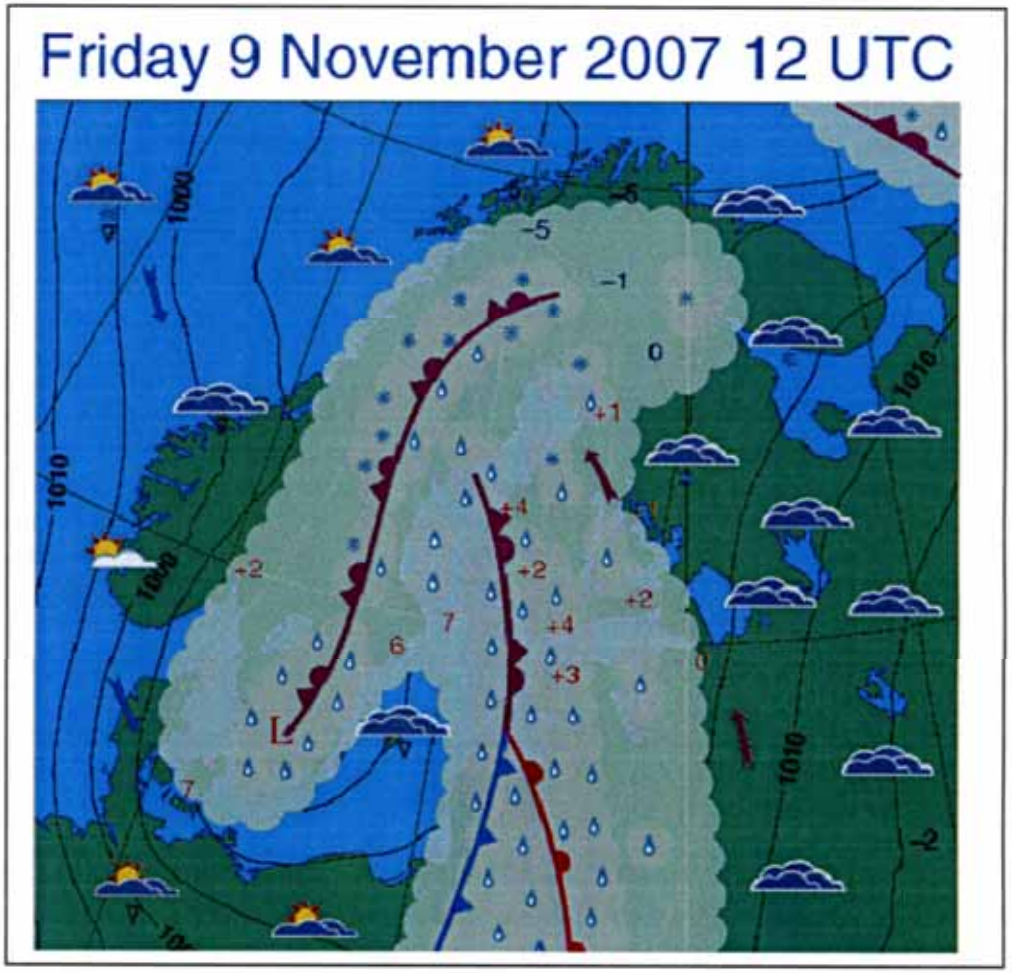
24 hr area accumulations used in verification





Small catchment case study

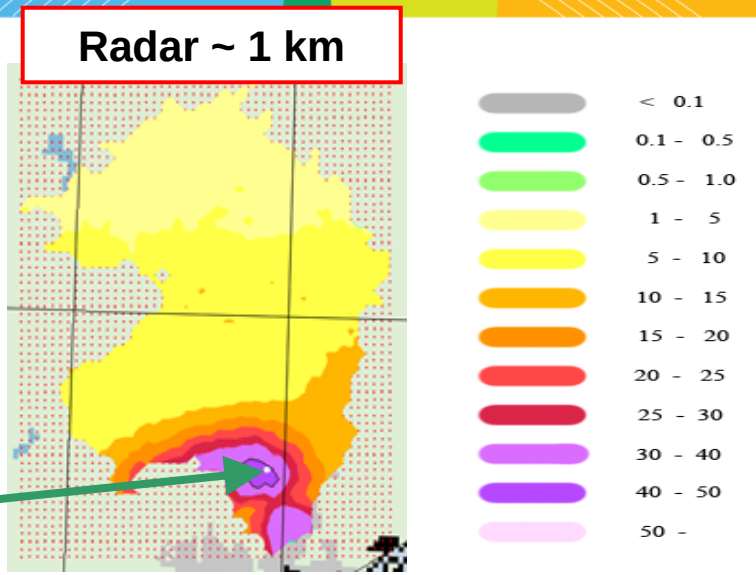


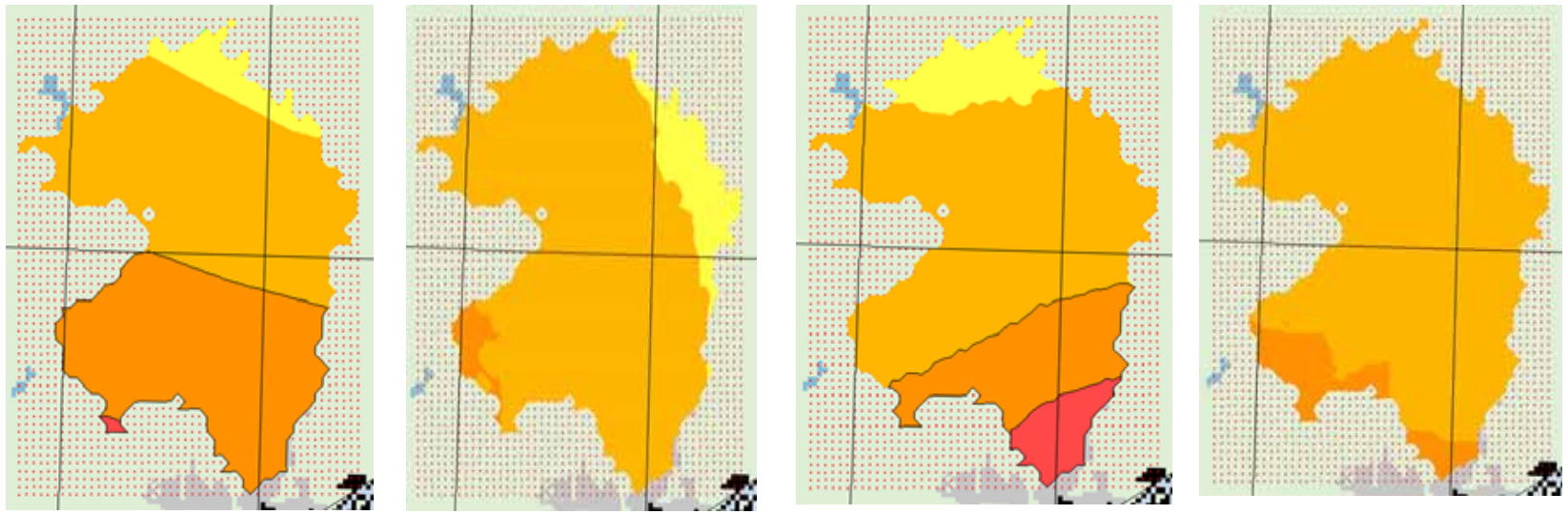


Small catchment case study

9 November 2007
24 hour precip

Helsinki Airport: 42 mm
in SYNOP obs





ECMWF ~ 25 km **HIR_RCR ~ 16 km** **HIR_MBE ~ 7.5 km** **MET_Edit ~ 15 km**

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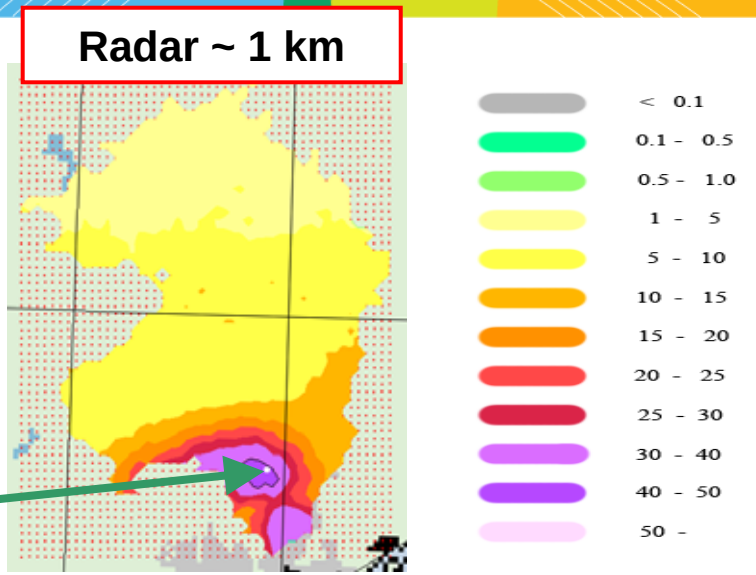

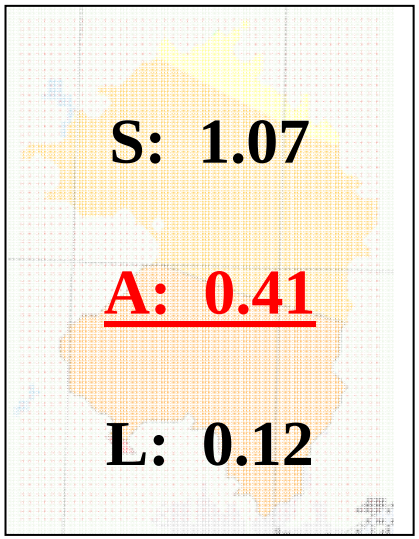

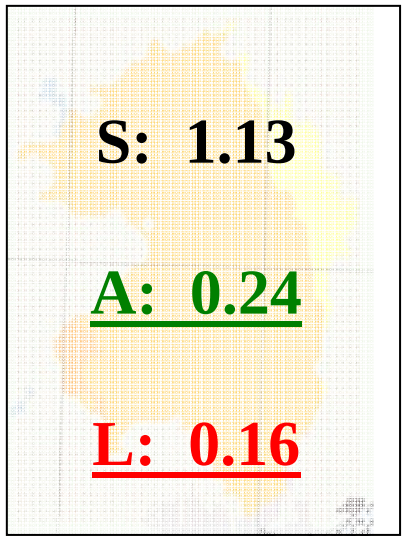

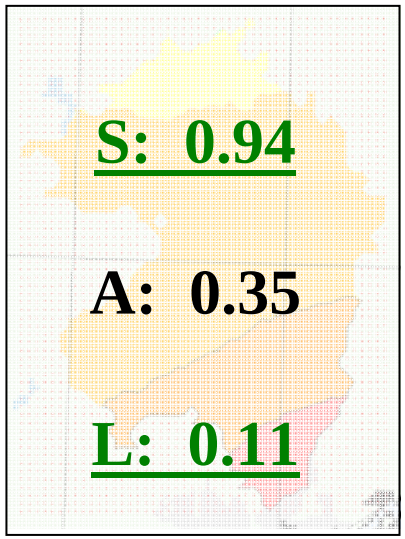

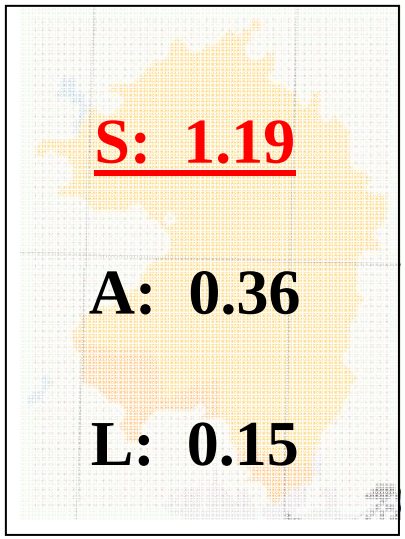

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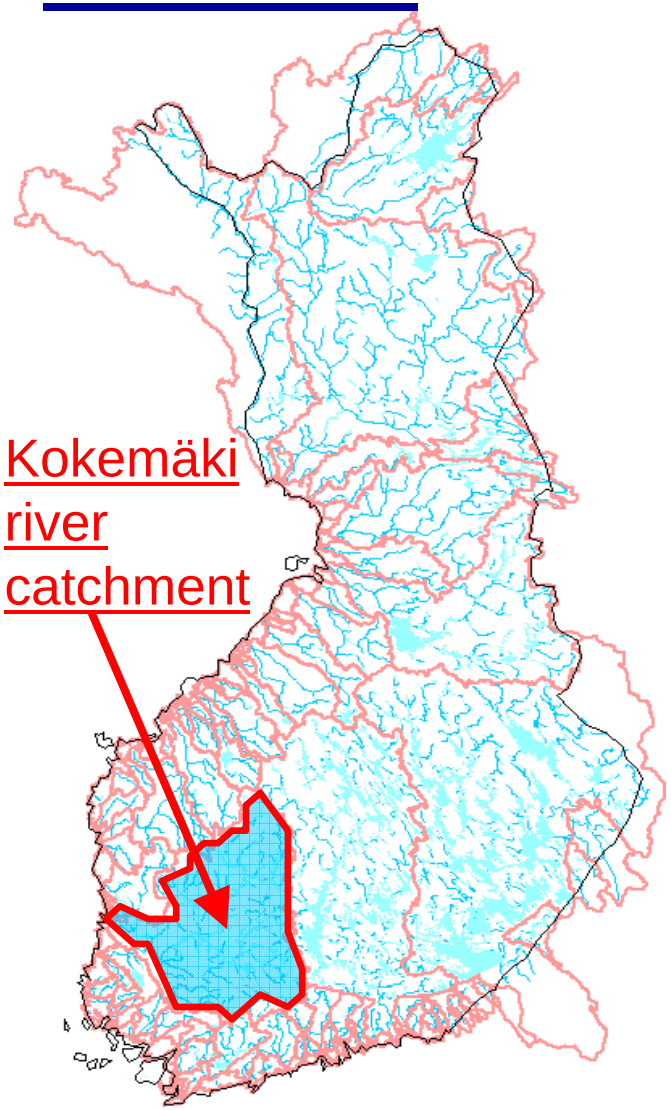
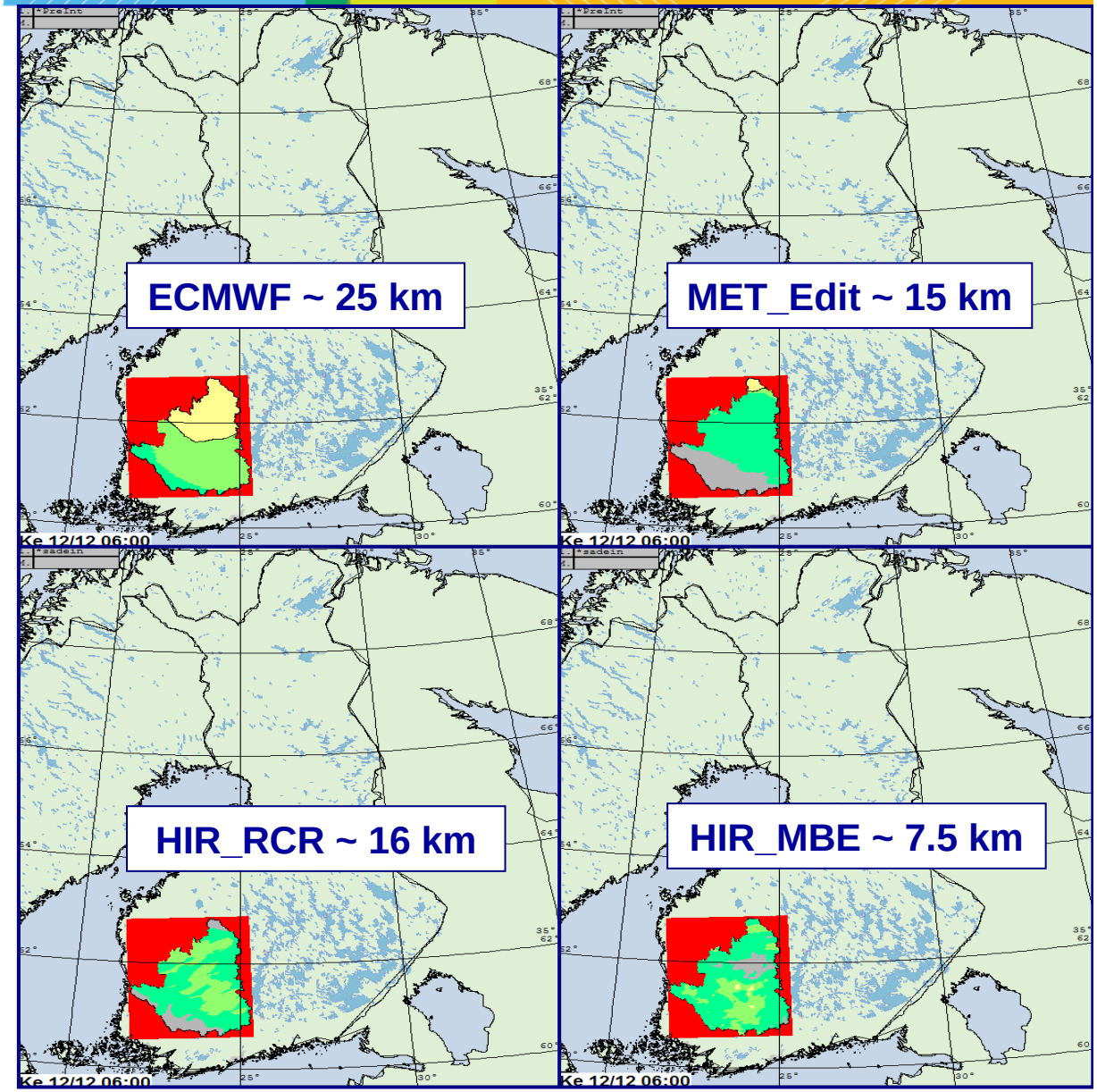
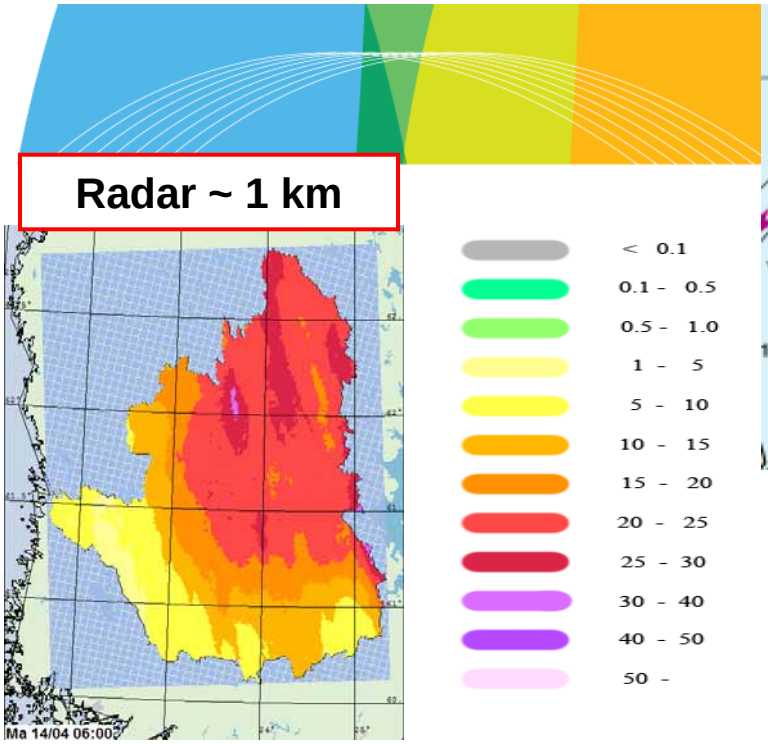
Medium-size catchment …

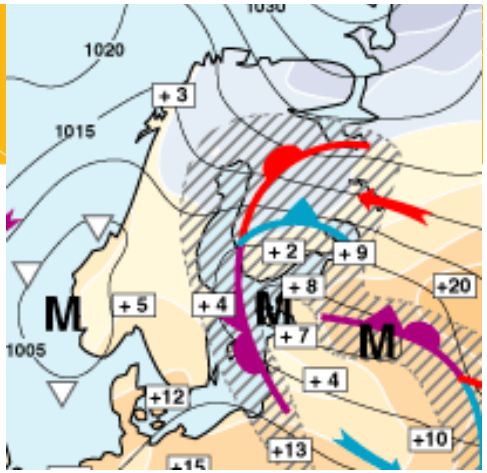


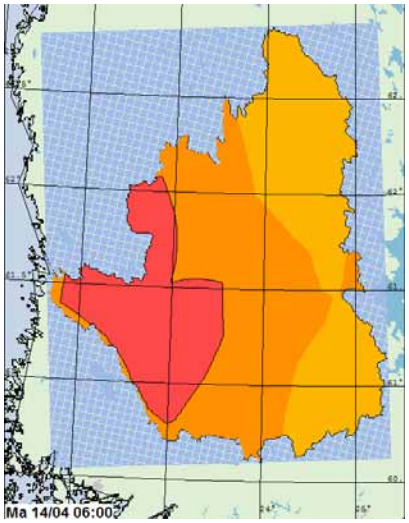


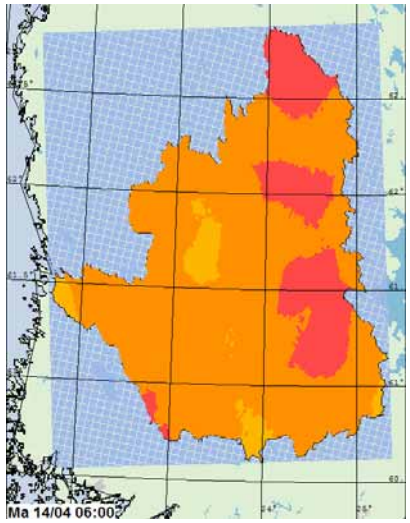
Medium-size catchment case 1

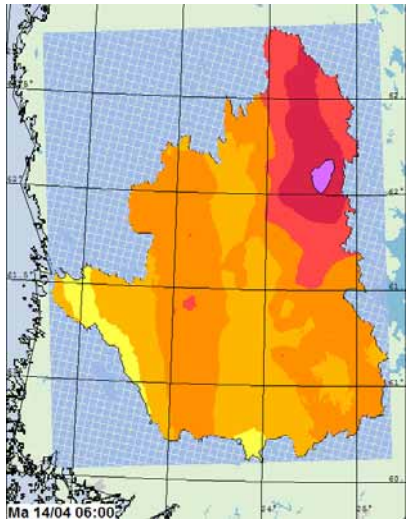
13 April 2008
24 hour precip

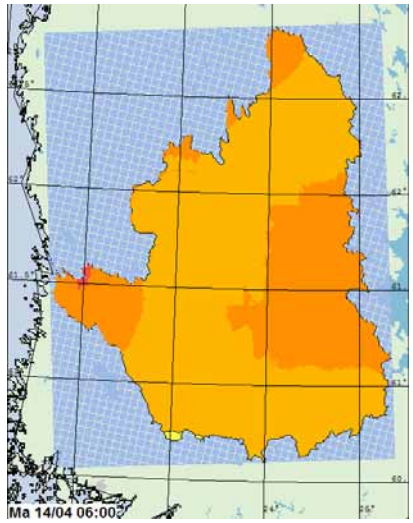












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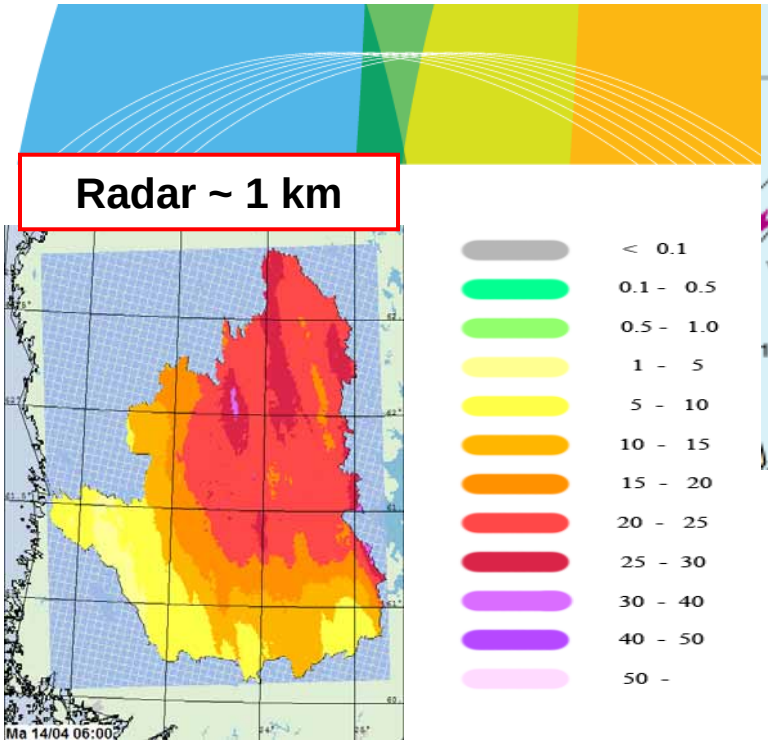

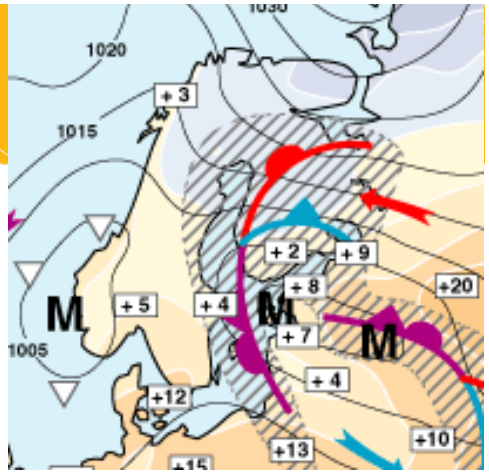

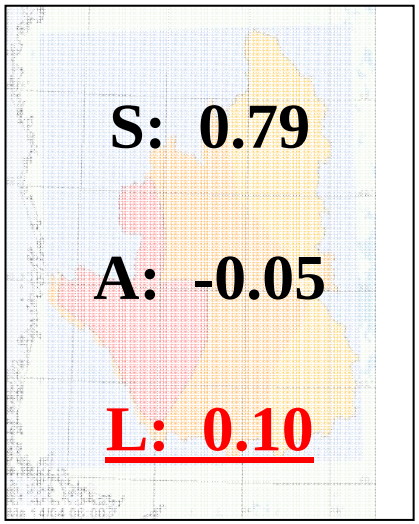

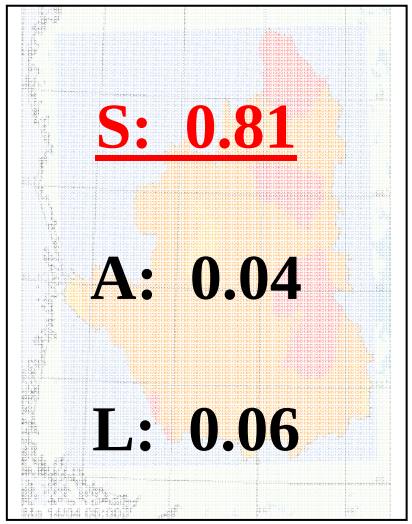

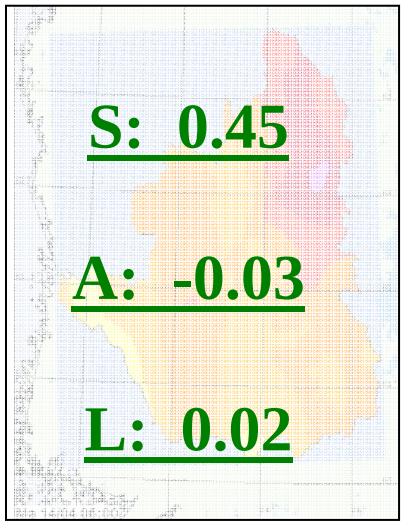

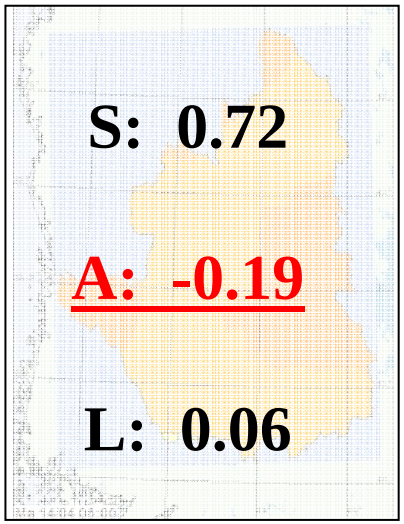

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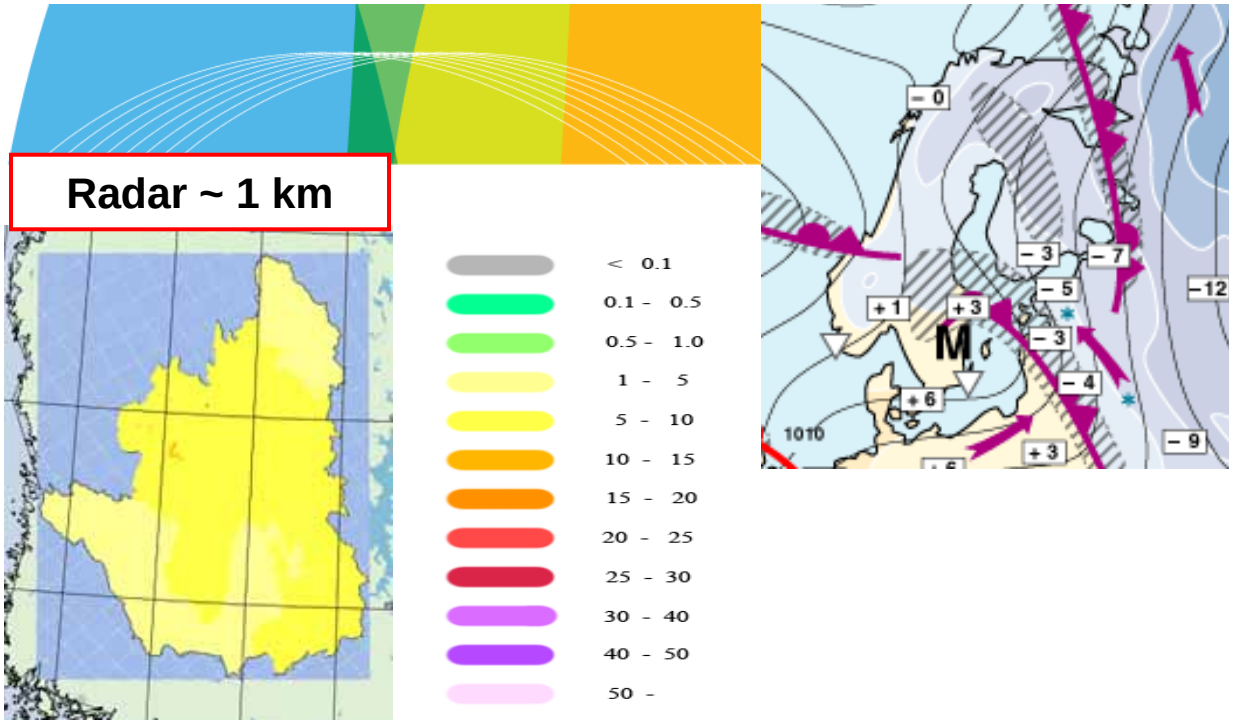
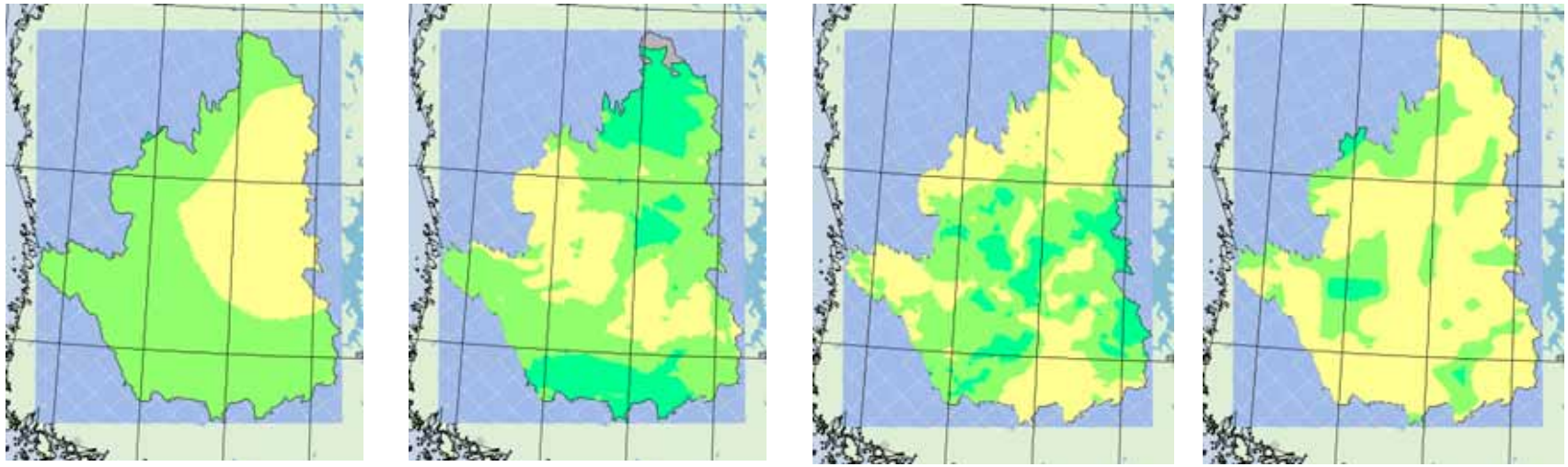
Medium-size catchment case 2

8 January 2008
24 hour precip

- **Snowfall** !





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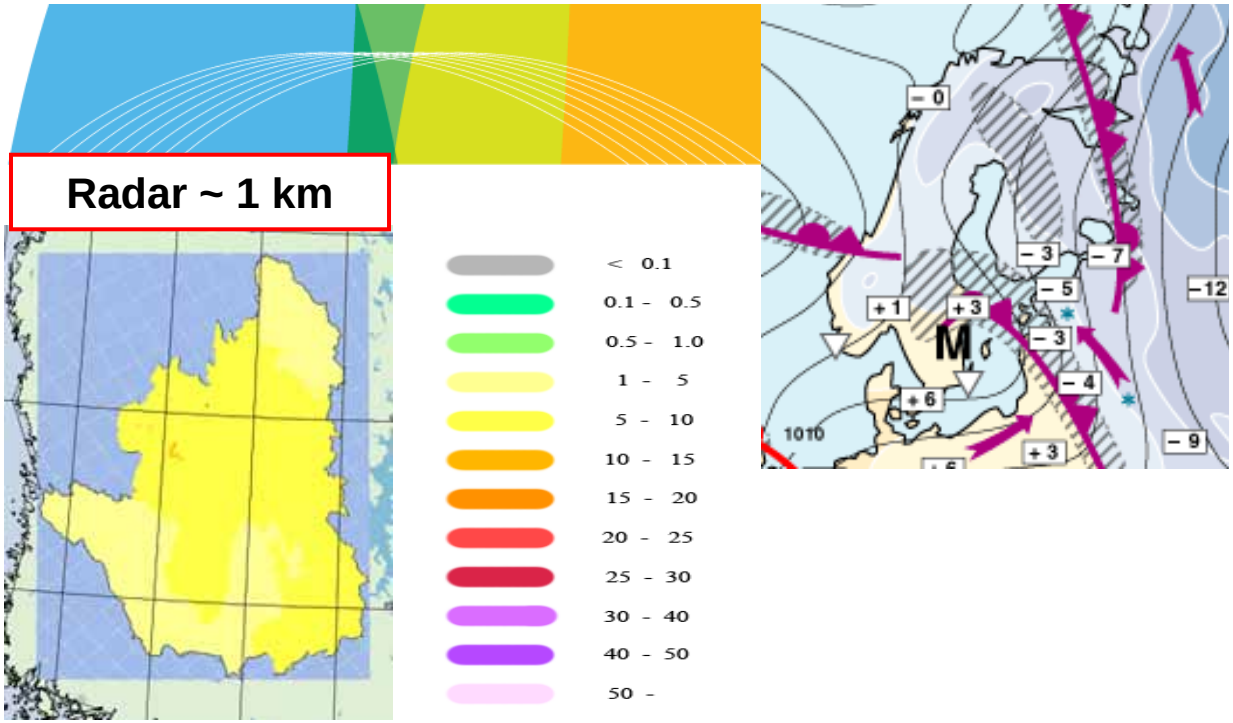


S: 0.65	S: 0.25	S: -0.15	S: 0.04
A: -1.41	A: -1.53	A: -1.44	A: -1.24
L: 0.02	L: 0.04	L: 0.01	L: 0.02

ECMWF ~ 25 km HIR_RCR ~ 16 km HIR_MBE ~ 7.5 km MET_Edit ~ 15 km

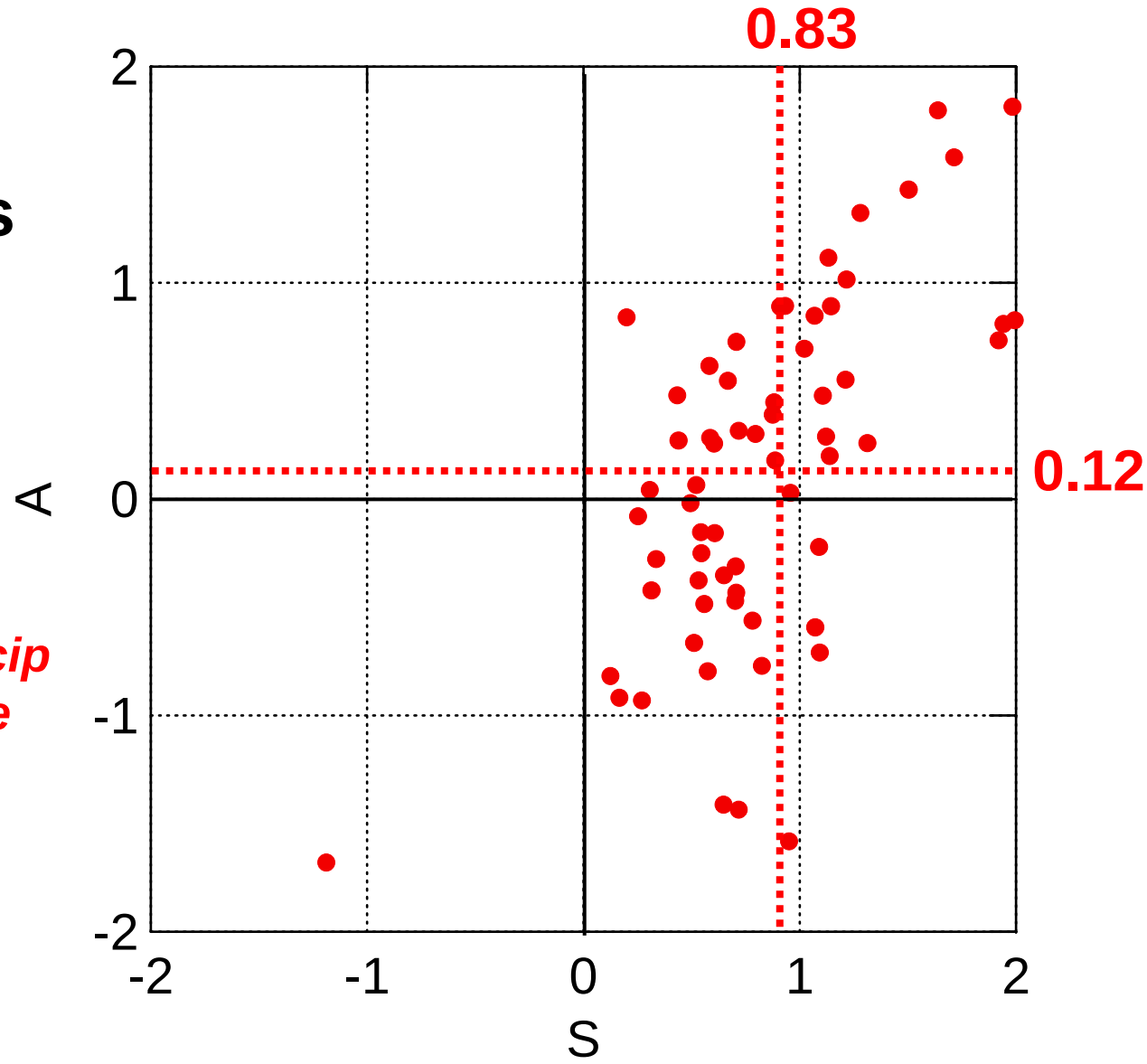
Medium-size catchment

Winter 07-08
SAL Statistics

(63 cases)

ECMWF

- Too large/flat precip objects, on average



Medium-size catchment

Winter 07-08

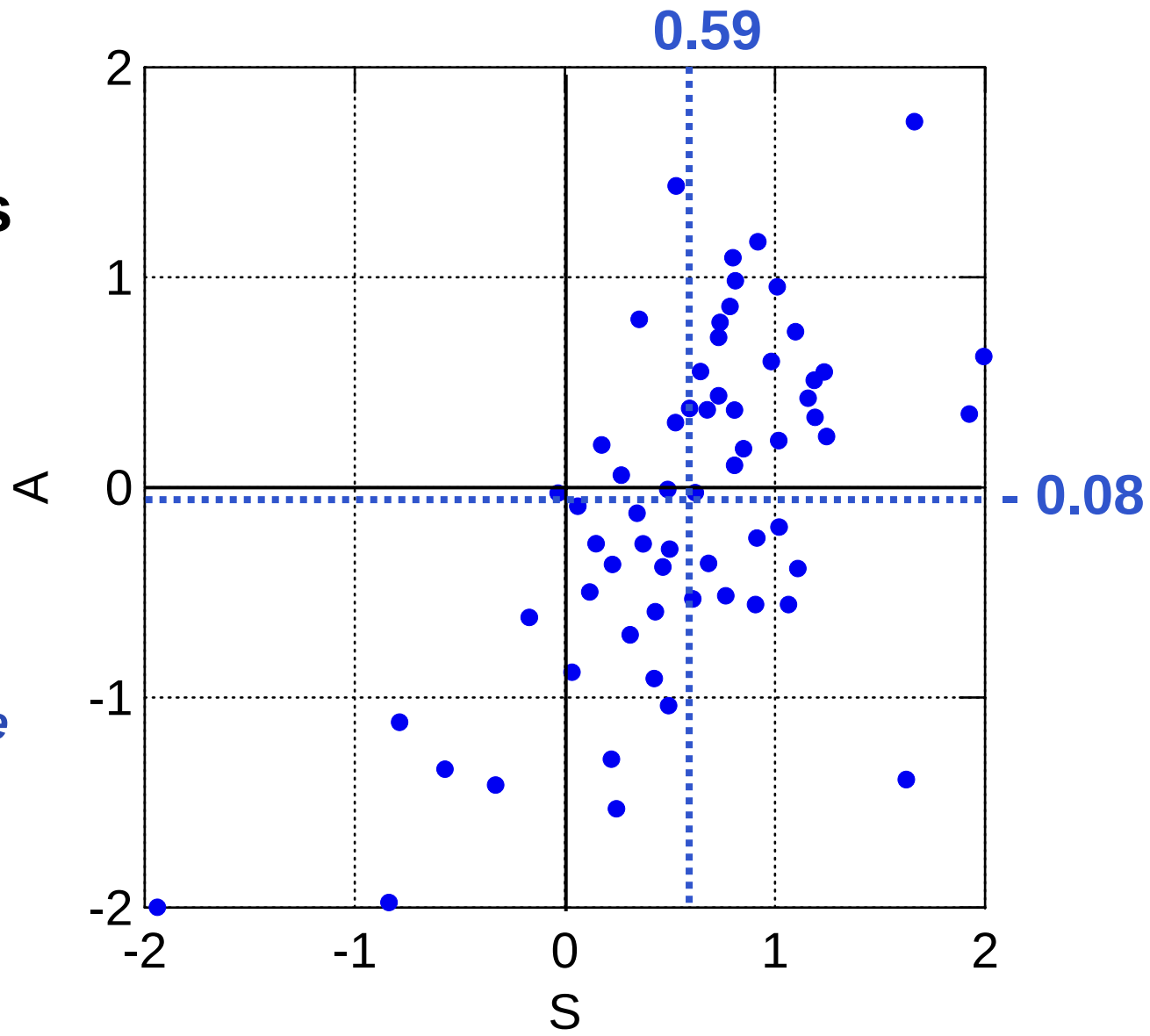
SAL Statistics

(63 cases)

HIR_RCR

(Reference)

- Somewhat too large/flat precip objects, on average



Medium-size catchment

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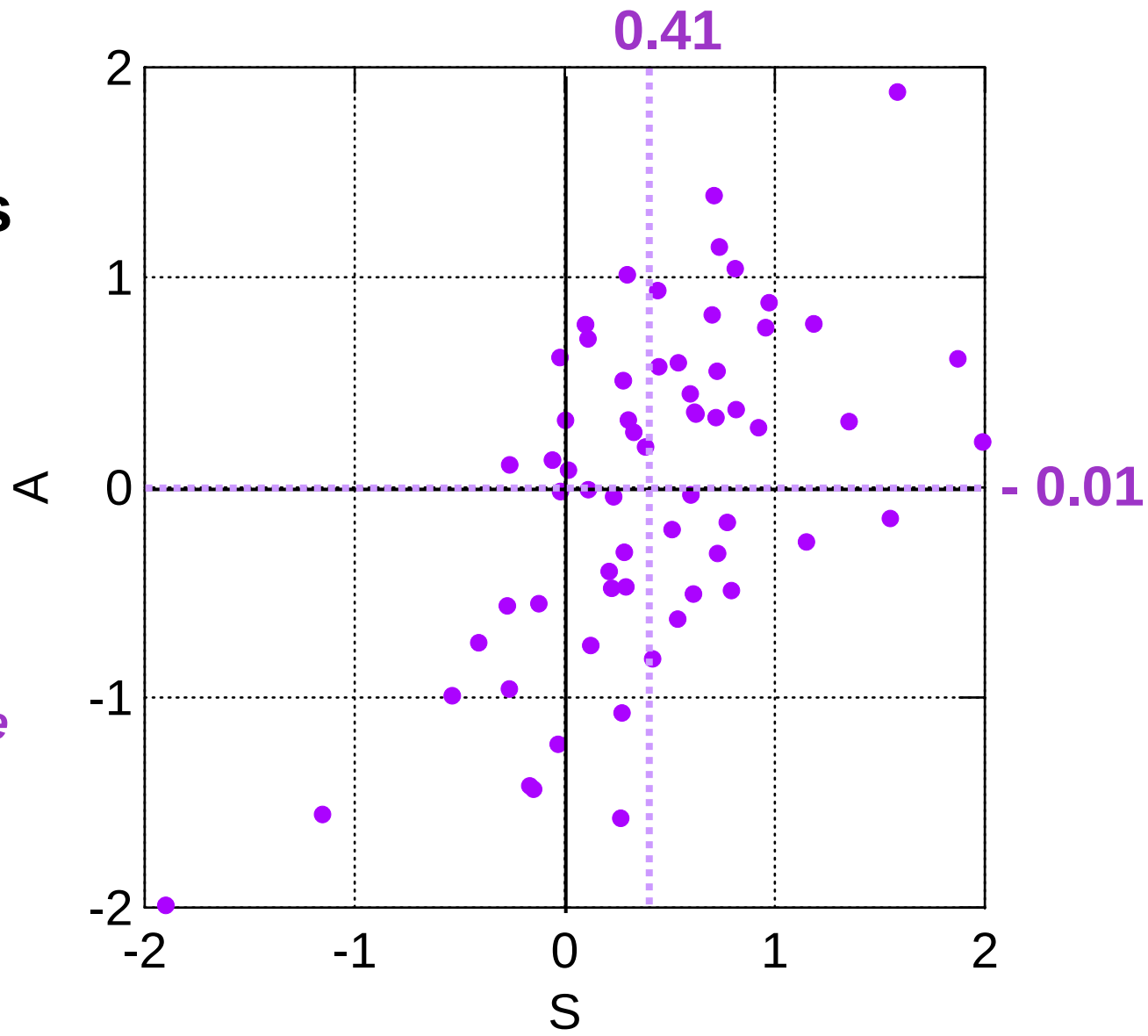
HIR_MBE

(MesoBeta)

- Slightly too large/flat precip objects, on average



Medium-size catchment

Winter 07-08
SAL Statistics

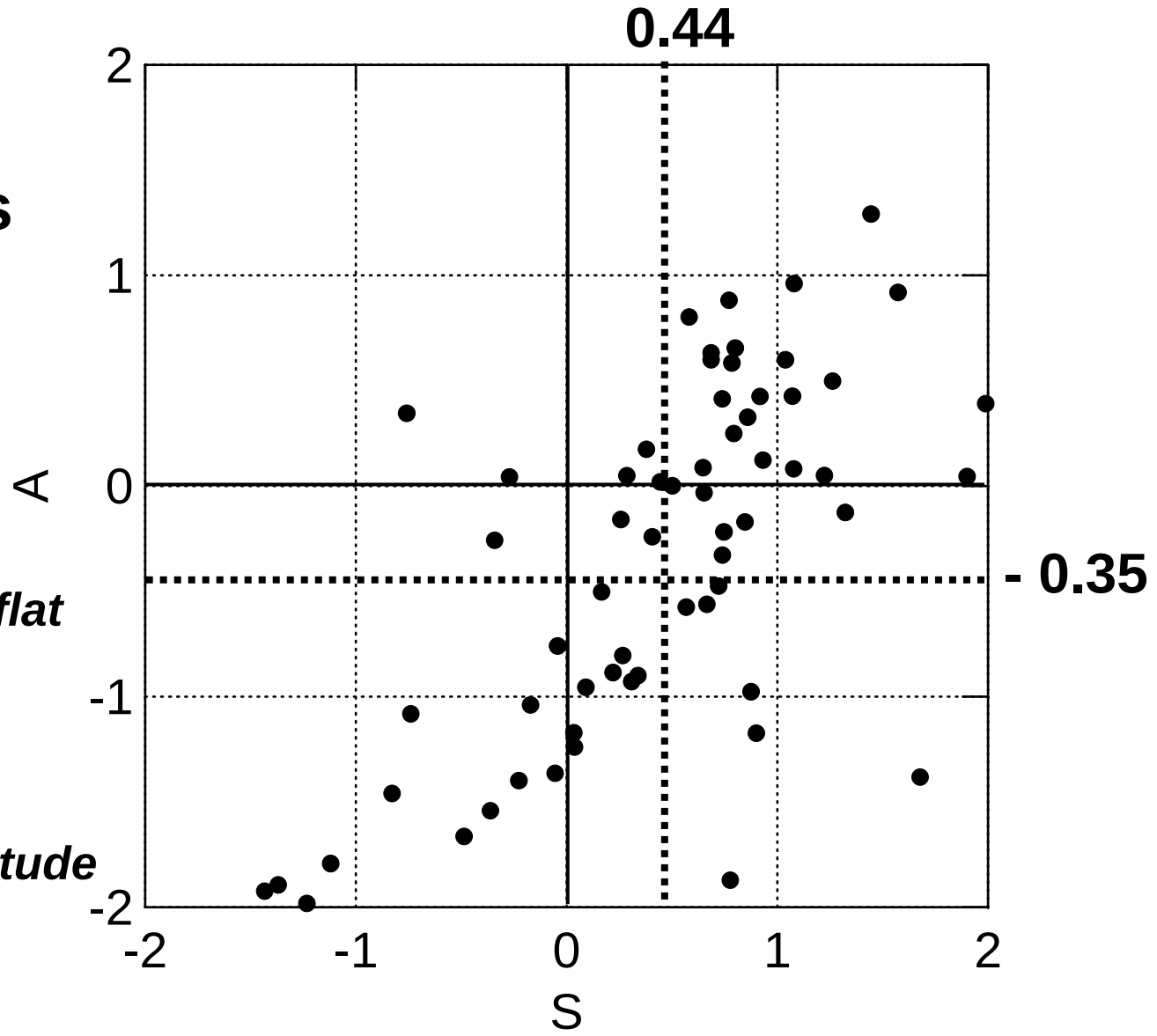
(63 cases)

Met_Edit

(EndProduct)

- Slightly too large/flat precip objects, on average

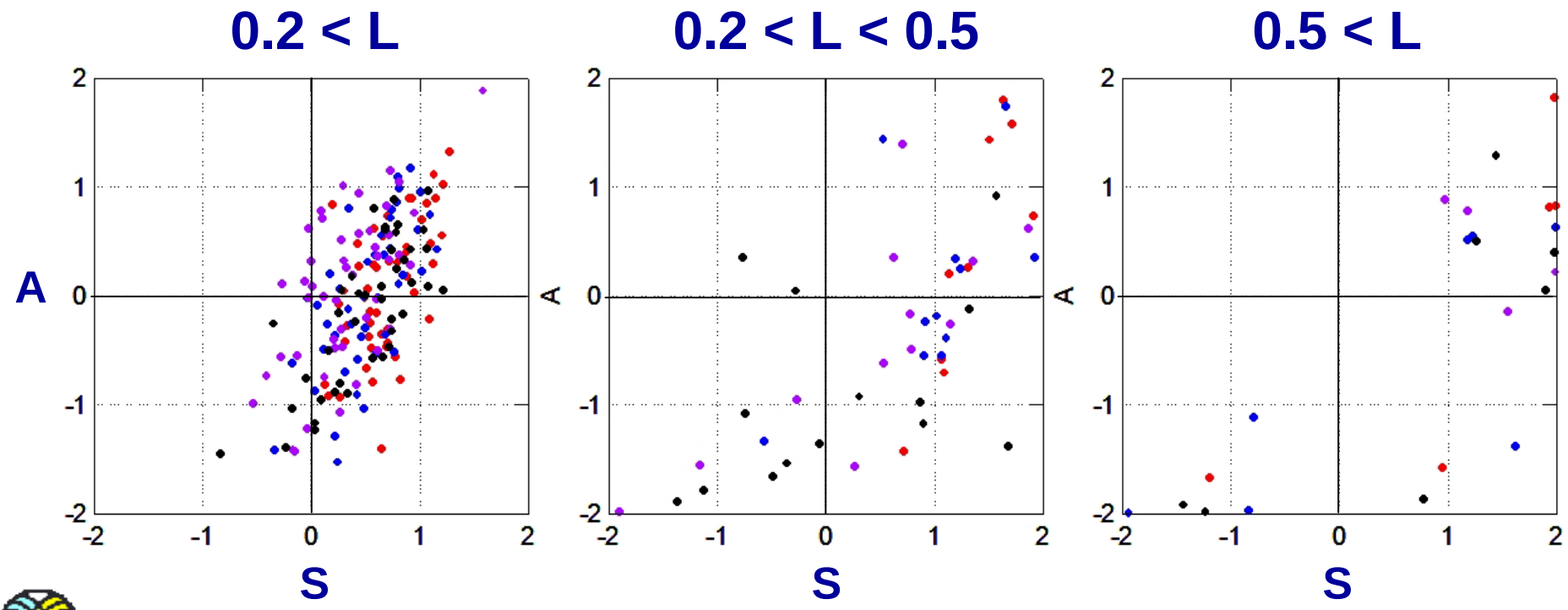
- Frequent under-estimation of amplitude



Medium-size catchment

Winter 07-08
SAL Statistics

All fcs aggregated - Stratified on parameter “L”



Future …

(potentially)

- ✓ **Need to better understand SAL behaviour**
- ✓ **Include AROME ~ 2.5 km model ⇔ Already initiated !**
- ✓ **Cover more / all catchments** (icl. Lake catchments)
- ✓ Apply **gauge ⇔ radar ⇔ *merged QPE*** as **"truth" info**
  i.e. analyse observation uncertainty ⇔ Verification
  - ➘ **Already started !**
- ✓ **Compare with other object-based schemes** (e.g. CRA)
- ✓ **Operational implementation…** (?)

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Grazie!

for your attention