Automated Control of Measurements and Data for Air Pollution Modelling




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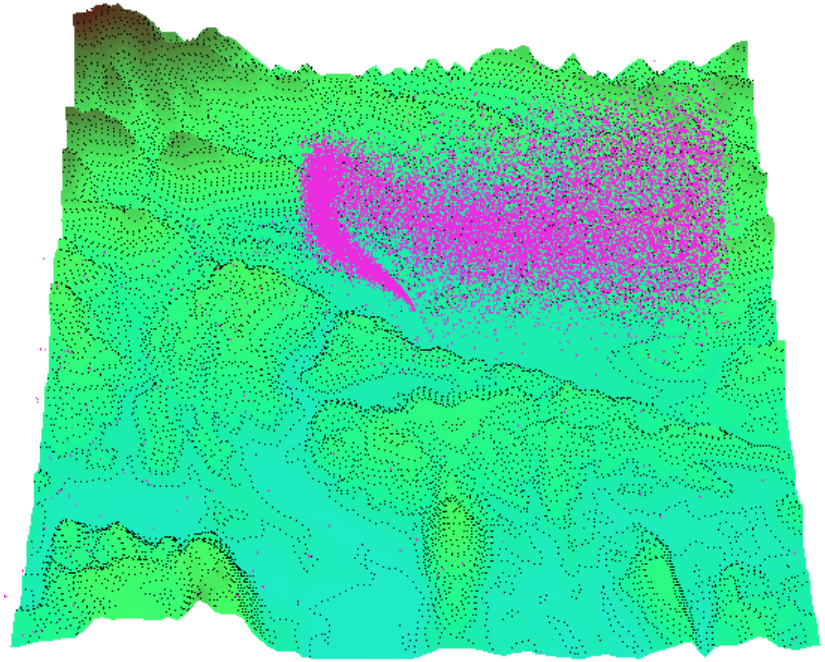
QUALITY OF AIR POLLUTION DISPERSION RESULTS?

METEO INPUTS:

- MEASUREMENTS
- FORECASTS

→ DISPERSION CALCULATION



QUALITY OF INPUTS IS IMPORTANT:

- FOR VALIDATION OF MODELS,
- FOR RESEARCH USE OF THE MODEL,
- FOR ROUTINE, REAL TIME USE OF THE MODEL
- FOR ROUTINE, OFF-LINE USE (EIA…)

QUALITY CONTROL OF INPUTS:

- **FOR VALIDATION OF MODELS,**
- **FOR RESEARCH USE OF THE MODEL,**

  CAN BE DONE MANUALLY

- **FOR ROUTINE, REAL TIME USE OF THE MODEL**
- **FOR ROUTINE, OFF-LINE USE (EIA…)**

  MUST BE DONE AUTOMATICALLY

HOW TO AUTOMATE INPUT DATA QUALITY CONTROL?

SIMPLE EXAMPLES:

BASIC METEOROLOGY…

ATMOSPHERIC MEASUREMENTS REAL TIME CHECKING

STANDARD STATISTICAL ELABORATION

=> RULES FOR DATA CHECKING:

- **AVERAGE IN SENSOR RANGE?**
- **AVERAGE IN MONTHLY EXPECTED RANGE?**
- **STANDARD DEVIATION REASONABLE?**
- **ARE EXTREMES REALISTIC?**
- **SENSOR STATUS == “OK” ?**
- **…..**

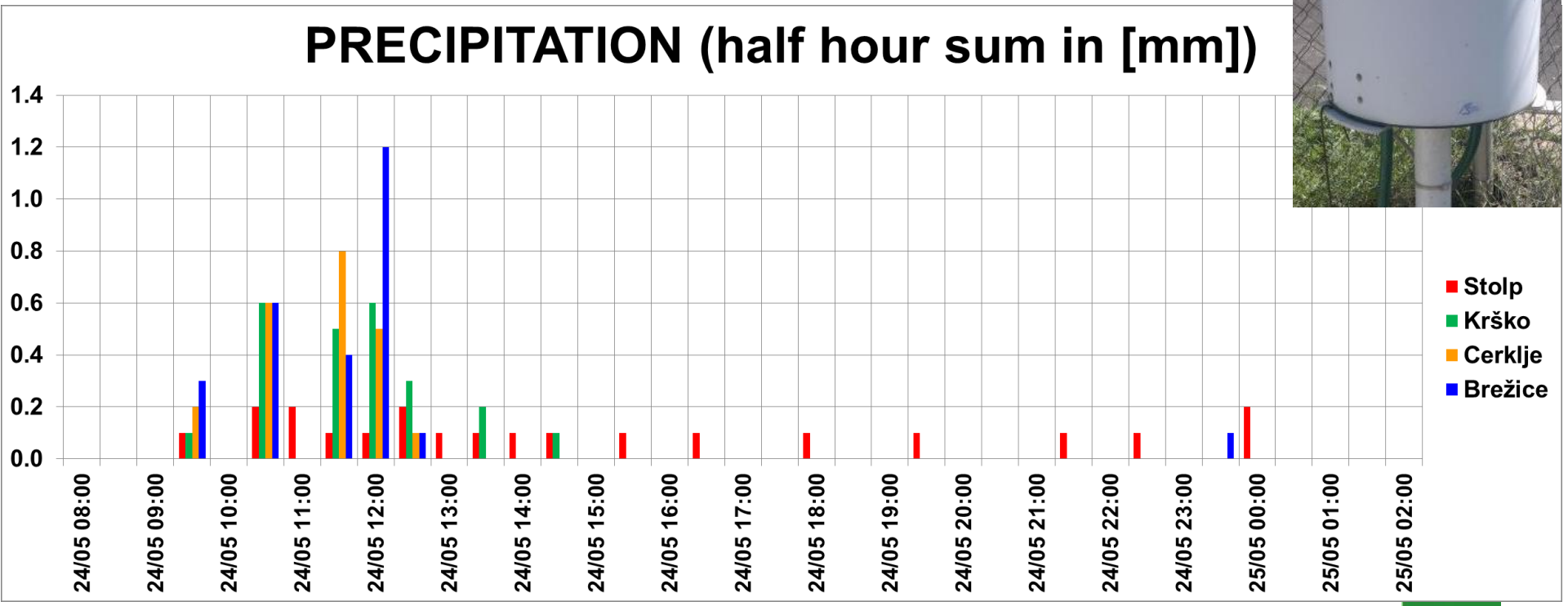
IF ALL IS OK => USE FOR DISPERSION MODELLING

IT IS USEFUL

- **TO HAVE META DATABASE ABOUT SENSORS**

NOT SO SIMPLE EXAMPLES OF BASIC MEASUREMENTS ERRORS

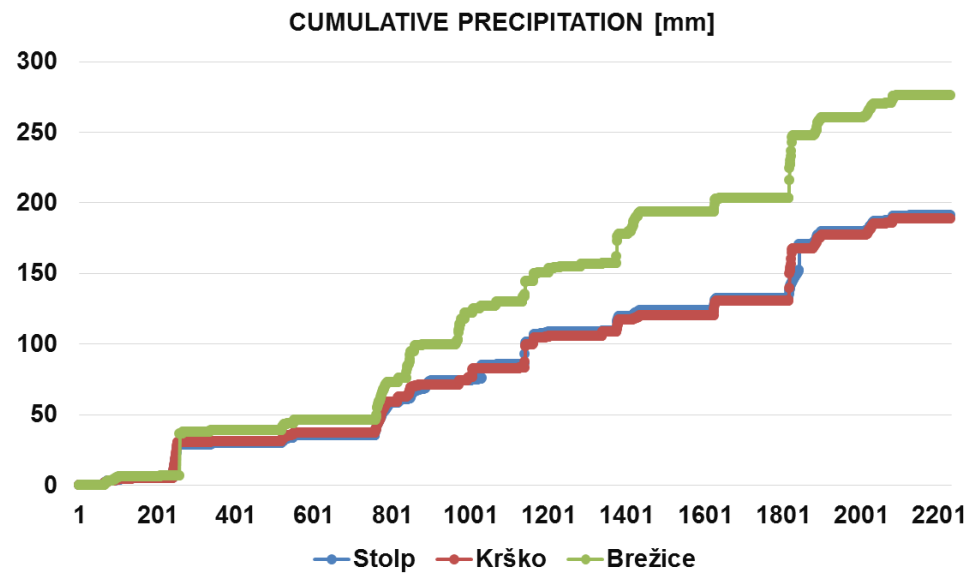
DUST (TREE LEAVES,…) INSIDE OMBROMETER
=> WRONG WET DEPOSITION….

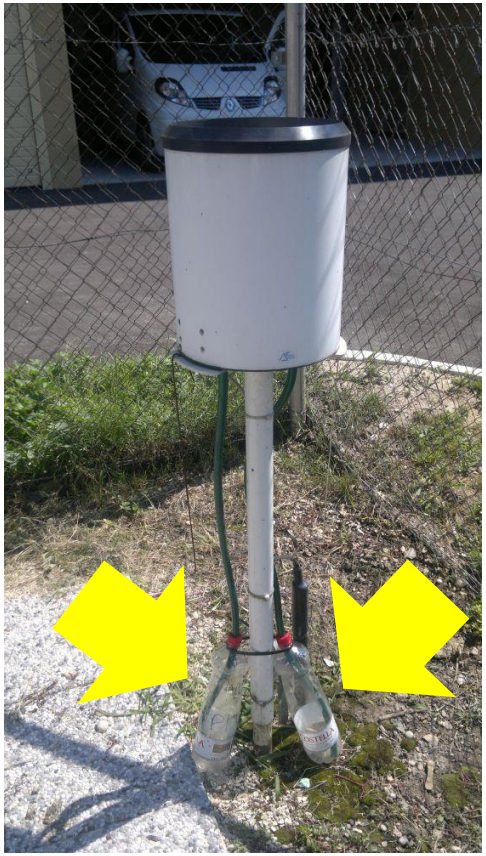


NOT SO SIMPLE EXAMPLES OF BASIC MEASUREMENTS ERRORS

OMBROMETER SISTEMATICALY SHOWING TOO HIGH VALUES ?

=> TOO HIGH WET DEPOSITION





SOLUTION?

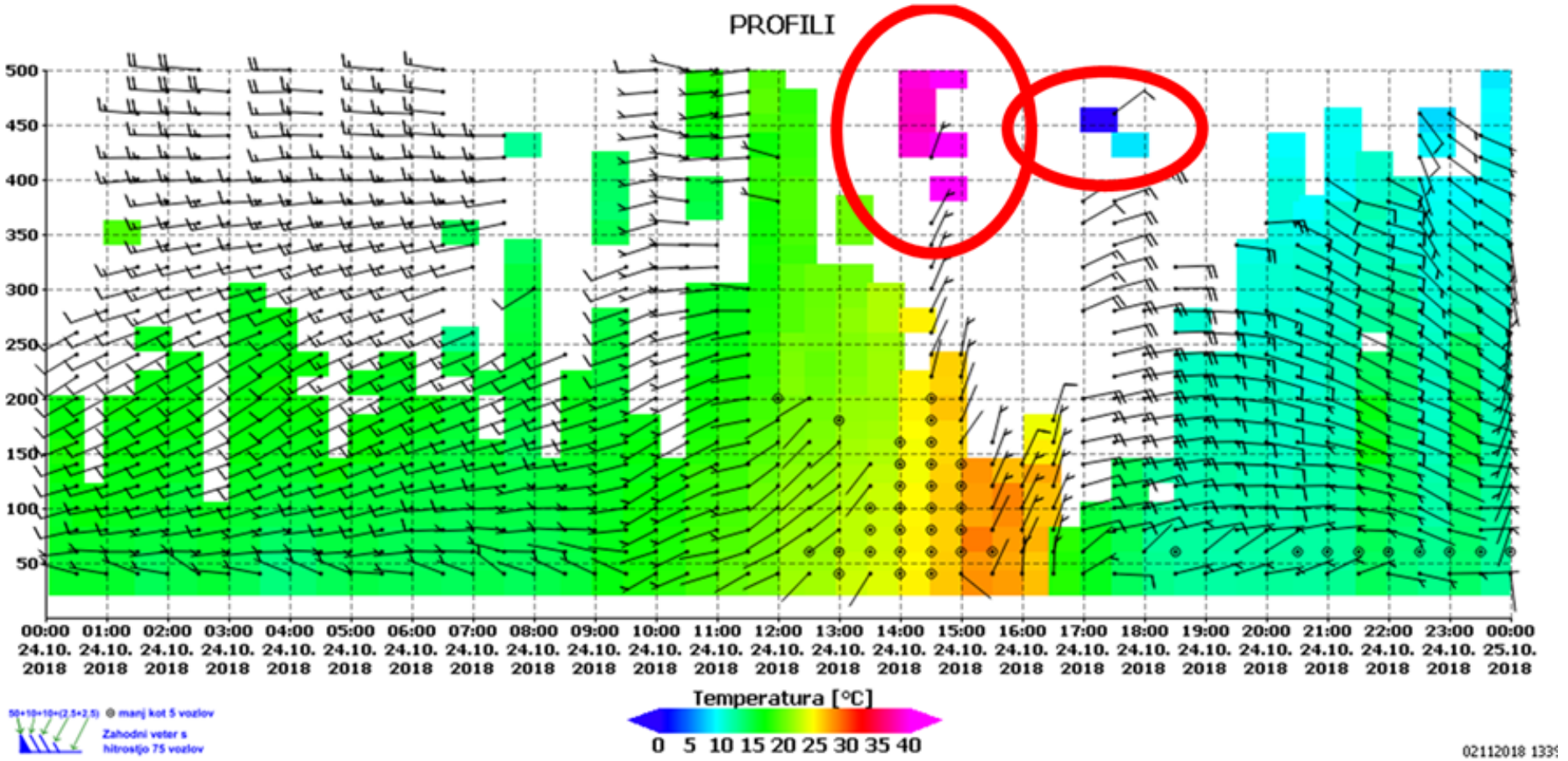
SENSOR WAS MOVED TO DIFFERENT LOCATION ☺

MORE SOPHISTICATED CASES:

VERTICAL REMOTE PROFILERS…

SODAR, RASS
ESSENTIAL VERTICAL PROFILES

SODAR , RASS



VISUAL INSPECTION

=> WE HAVE A PROBLEM !!!

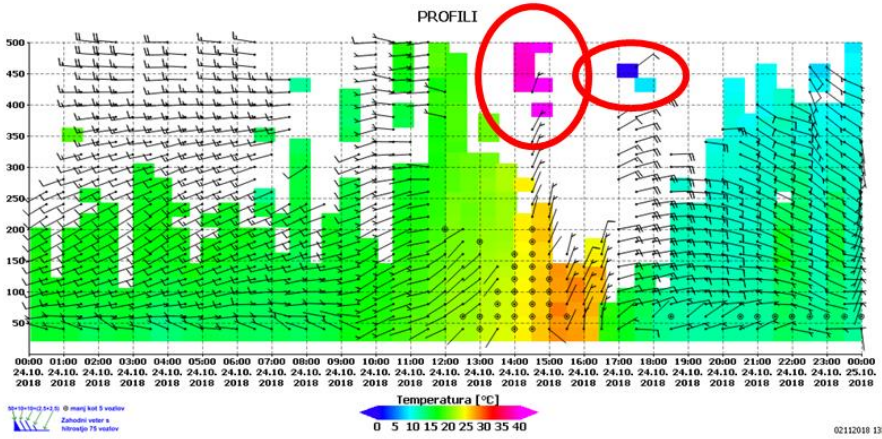
SOLUTION FOR TEMPERATURE

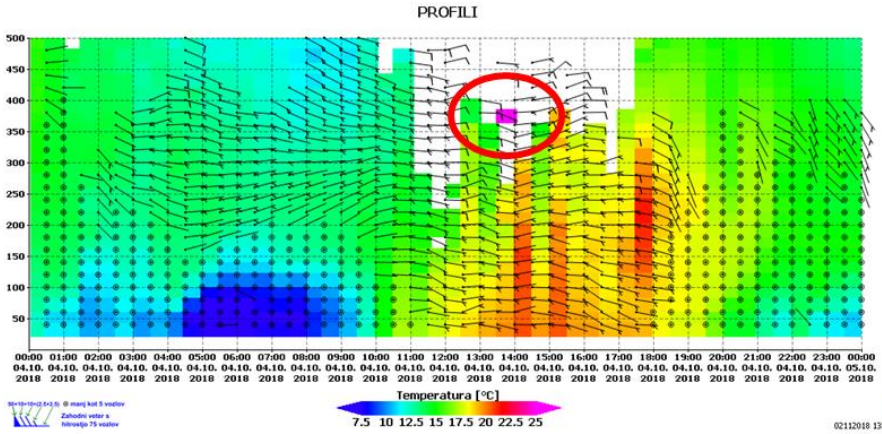
IN ADDITION TO MANUFACTURER CONTROLS:

- **FEW HOURS STATISTICS OF MIN / MAX, ST.DEV.**
- **VALUES OUTSIDE [-2*st.dev, +2*st.dev.] are wrong**
- **TESTED ON TWO YEARS OF DATA ☺**

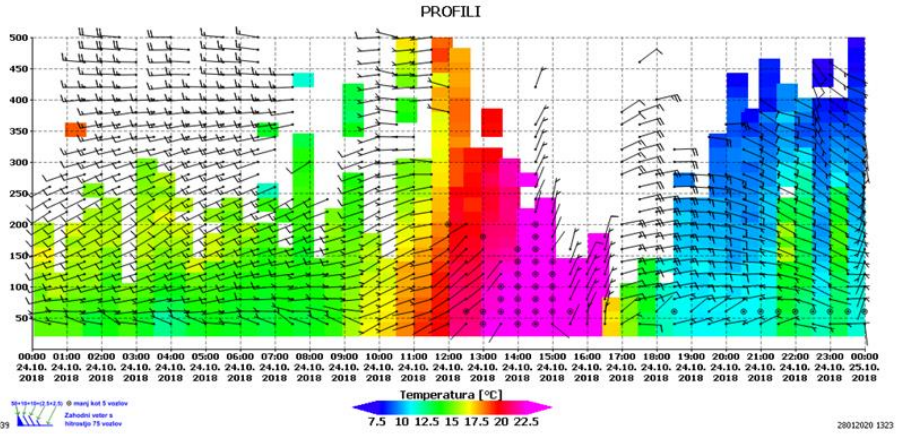
SODAR, RASS

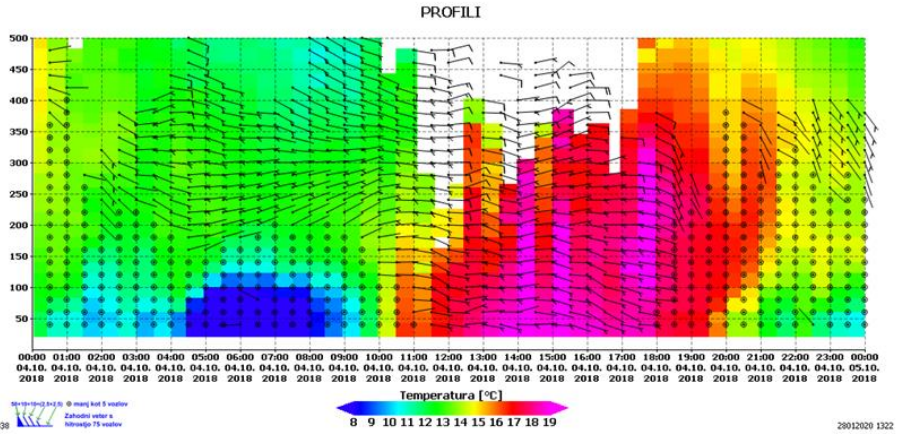
ERRORS:





CORRECTION:





RELATIVE SCALES!

WEATHER FORECASTS REAL TIME CONTROL:

- INPUT GLOBAL DATA “FRESH”?
- CALCULATION ENDED WITHOUT ERRORS?

- NOT MUCH OTHER IDEAS…
- …..

IF ALL IS OK => USE FOR DISPERSION MODELLING

DISPERSION RESULTS REAL TIME CONTROL:

- CALCULATION ENDED WITHOUT ERRORS?
- ALL REQUIRED INPUTS WERE AVAILABLE?
  - IF NOT =>
    - METEO DATA QUANTITY NOT TOO LITTLE?
    - DO WE HAVE ATMOSPHERIC VERTICAL PROFILES?

      => GRADE MIN - MAX
- …..

USER SHOULD BE AWARE OF RESULT'S STATUS / GRADE

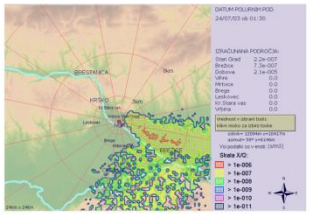
EXAMPLE OF IMPLEMENTATION:

ENVIRONMENTAL EXPERT SYSTEM NPP KRŠKO

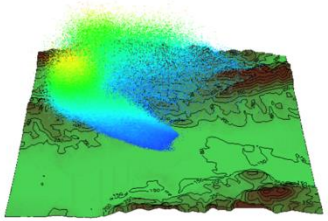
REACTOR POWER

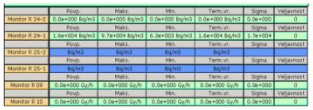
REACTOR CORE ACTIVITY

EMISSION RADIOLOGICAL MONITORS RMs...



DEDICATED SOFTWARE FOR DOSE ASSESMENT





RM MEASUREMENTS SOURCE TERM

"EIS" SYSTEM DATABASE

LAGRANGIAN PARTICLE MODEL

γ MEASUREMENTS (OUTSIDE)

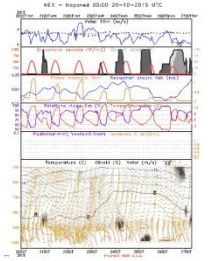
- MFM (CIRCLE)
- BDKG (METEO)
- SAPHYMO (FENCE)

METEO MEASUR.

3D METEO

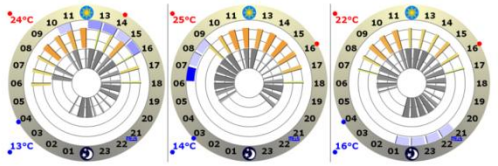
DIAGNOSIS

PROGNOSIS



- SODAR
- RASS
- AMS-s

METEO PROGNOSIS



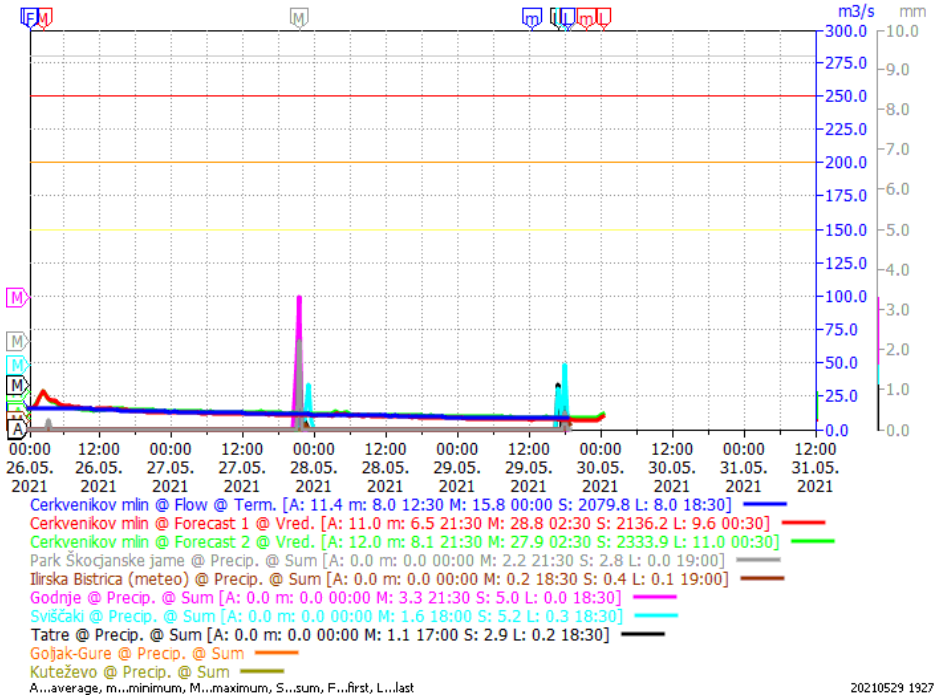
KARST CAVE FLOODS MODELLING


Flow rate model


River flow rate


River water level


Precipitation



WHY IS THIS IMPORTANT?

- **INFO ABOUT RESULTS RELIABILITY**

  WARNINGS OF POSSIBLE ERRORS

Thank you !

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