

AN INNOVATIVE PROCEDURE FOR 2D PWV MONITORING ON A WIDE AND OROGRAPHICALLY COMPLEX AREA WITH EXISTING INFRASTRUCTURES

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FROM ZTD TO PWV: G4M PROCEDURE

INPUT DATA

- ZTD ESTIMATIONS** FROM GNSS PERMANENT STATIONS (PSS) NETWORK (FIG. 1)
 - 181 GNSS PSS FROM GLOBAL, INTERNATIONAL, NATIONAL AND REGIONAL NETWORKS
 - AVERAGE SPACING: 40 KM IN FRENCH-ITALIAN BORDER REGION
 - 3 SUB-NETWORKS ACCORDING TO PS AGE
 - 15 COMMON STATIONS → STABLE REFERENCE FRAME
- PRESSURE (P) AND TEMPERATURE (T) OBSERVATIONS** FROM NOAA METEOROLOGICAL STATIONS (FIG. 2)
- DIGITAL TERRAIN MODEL (DTM)** → ASTER GDEM

EXISTING INFRASTRUCTURES NOT CO-LOCATED

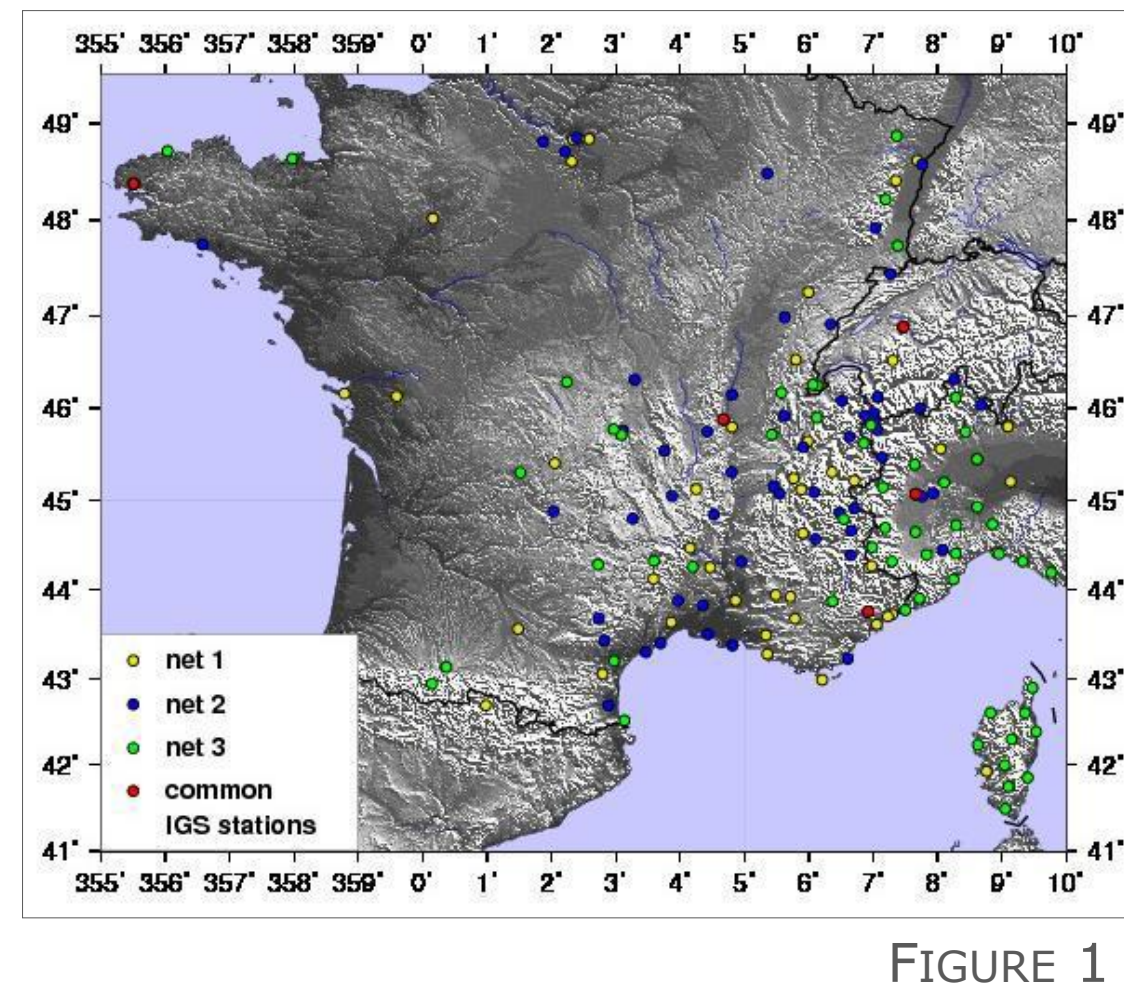


FIGURE 1

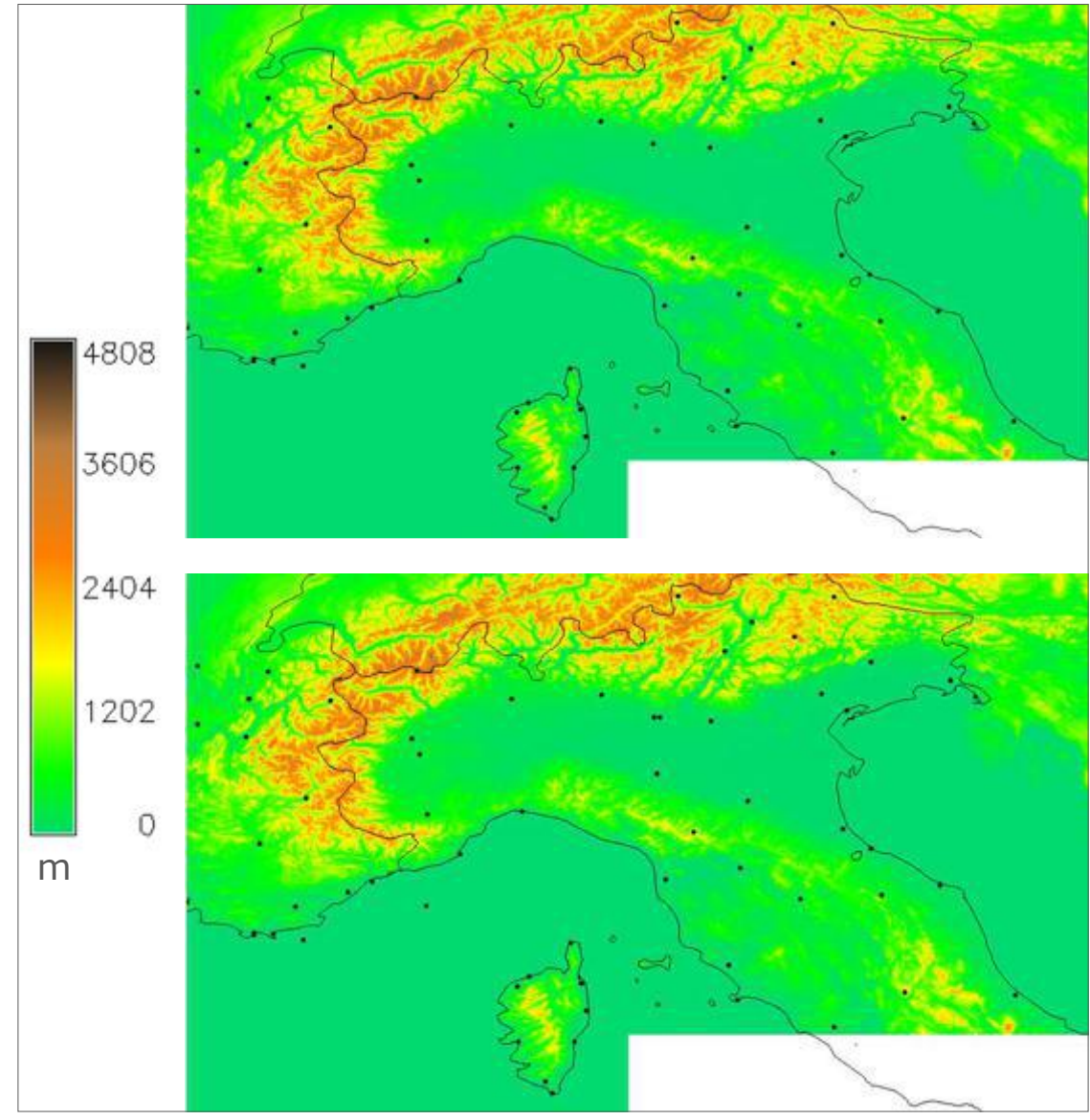
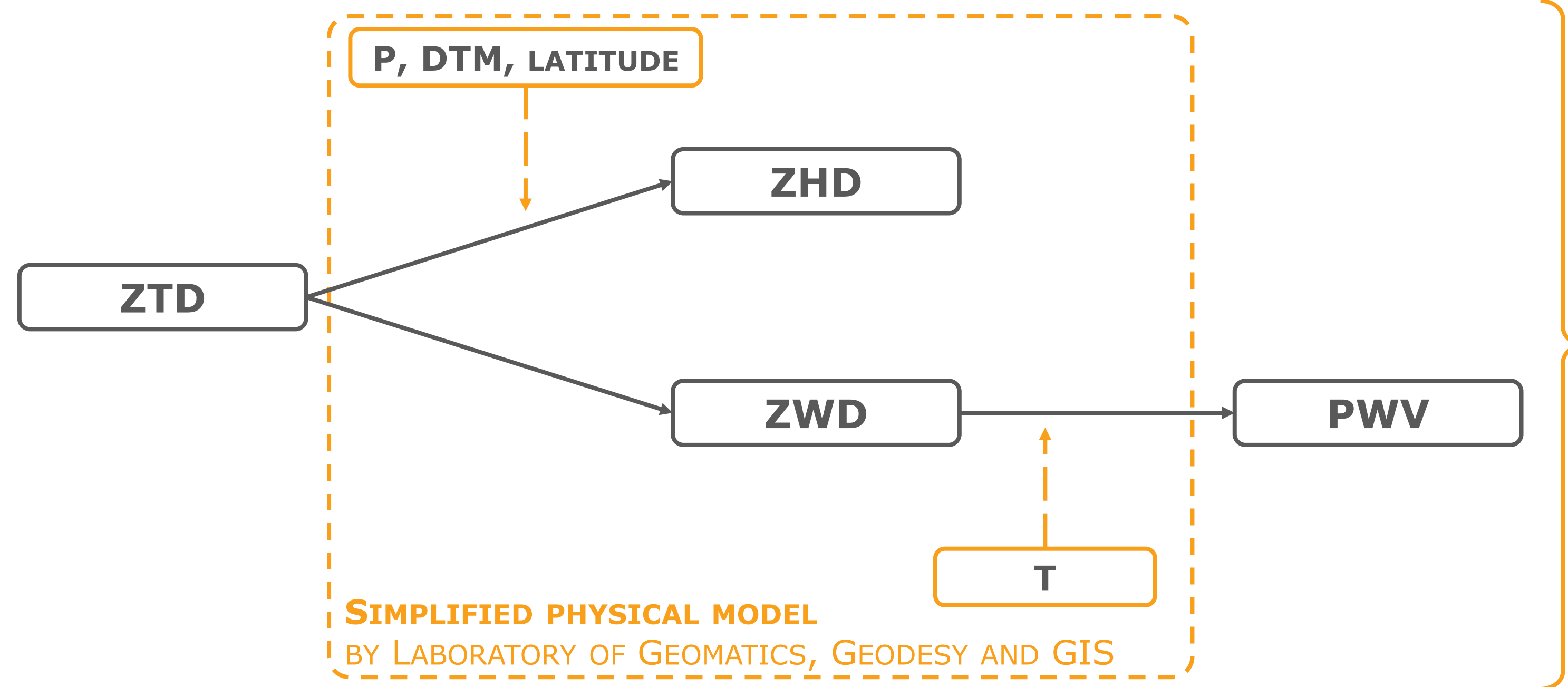


FIGURE 2



1D INPUT DATA
↓
INTERPOLATION
+
SIMPLIFIED MODEL

RESULTS AND VALIDATION

RESULTS

- PWV MAPS** (FIG. 3A)
 - LOW DENSITY APPROACH: TWO-HOURLY DATA + LOW RESOLUTION (~ 10 KM) → A POSTERIORI MONITORING
 - HIGH DENSITY APPROACH: 6 MINUTES DATA + HIGH RESOLUTION (~ 250 M) → NEAR REAL-TIME MONITORING
- ΔPWV MAPS**: DIFFERENTIATION OF PWV MAPS WITH RESPECT TO A "CALM MOMENT" (FIG. 3B) → OROGRAPHIC EFFECT REMOVAL → EVOLUTION OF PWV IN SPACE AND TIME
- HETEROGENEITY INDEX (HI) MAPS**: OBTAINED FROM ΔPWV SPATIAL VARIABILITY, INDICATOR OF SEVERE EVENT OCCURRENCE (FIG. 3C) → LOCALIZATION IN SPACE AND TIME

EVIDENT OROGRAPHIC EFFECT

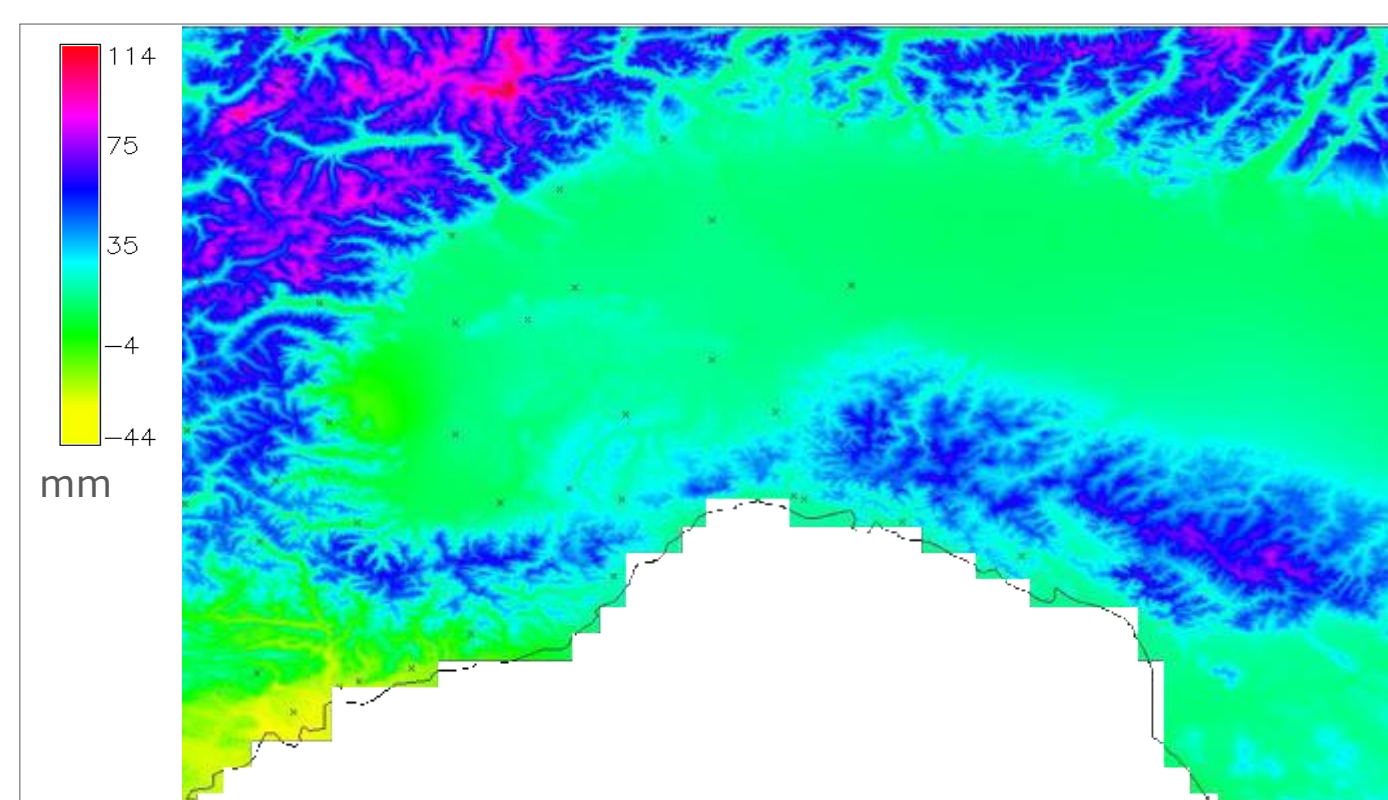


FIGURE 3A

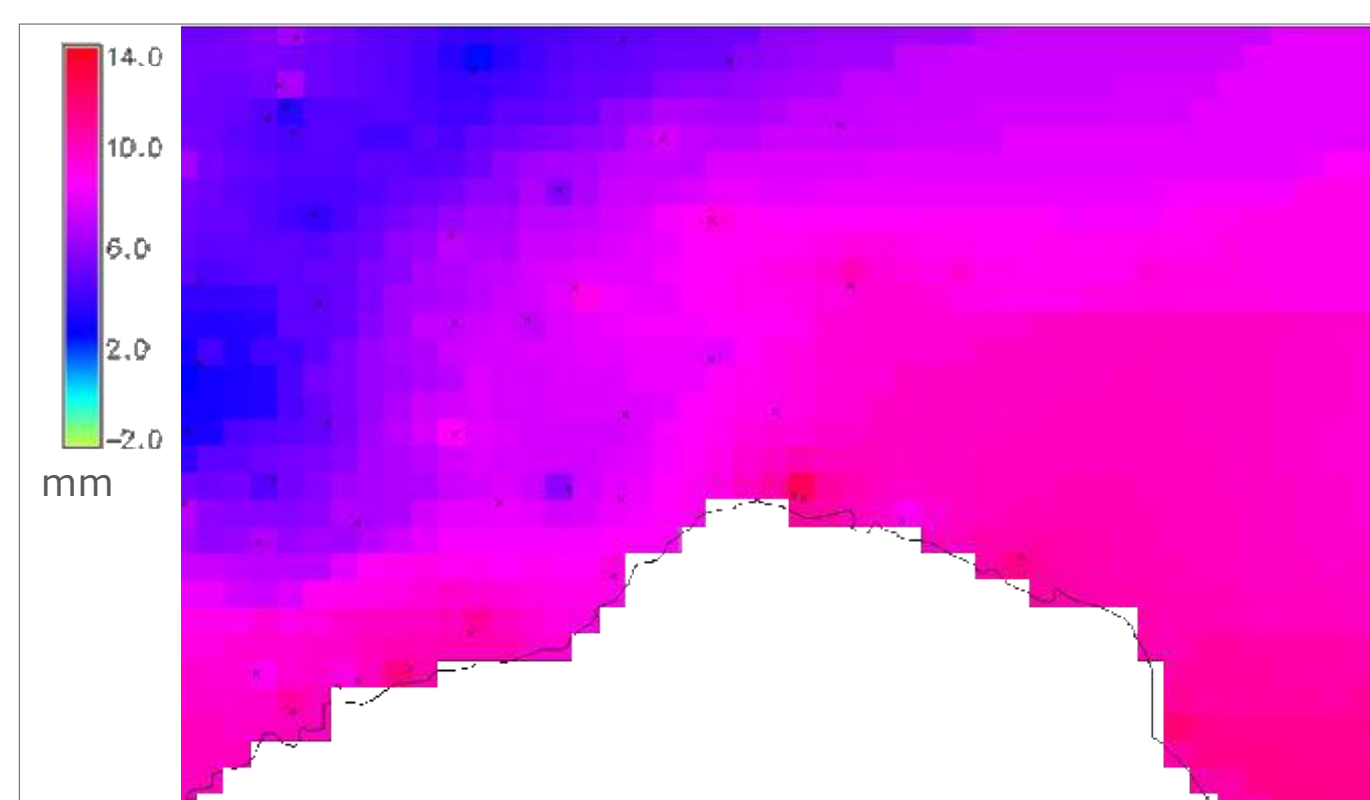


FIGURE 3B

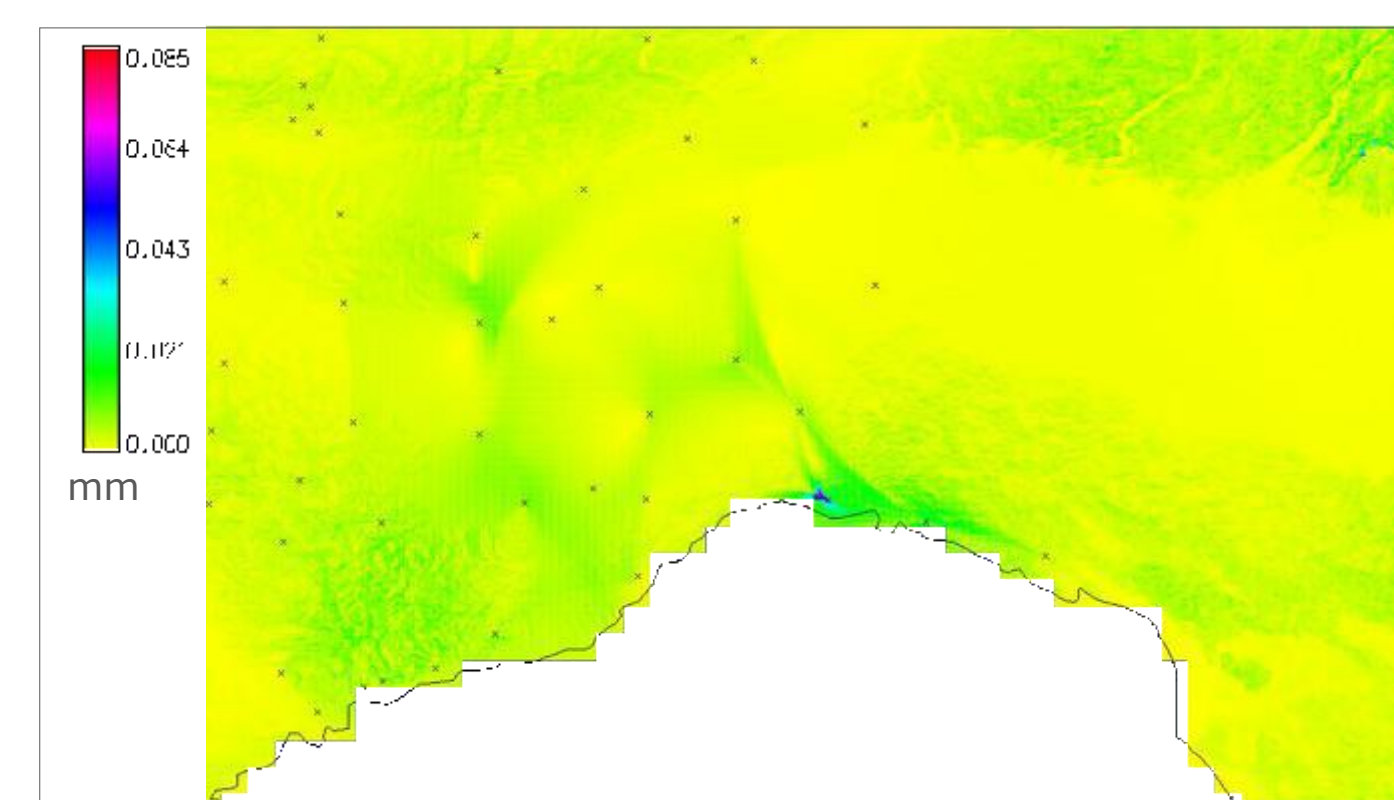


FIGURE 3C

VALIDATION

- ZTD ESTIMATIONS**: COMPARISON WITH IGS OFFICIAL PRODUCTS (FIG. 4)
- PWV MAPS**: COMPARISON WITH METEOROLOGICAL RE-ANALYSIS FROM WRF MODEL
 - 2D DIFFERENCE MAP (FIG. 5A) → DIFFERENCES MAINLY LOCATED ON HIGH ALTITUDE AREAS
 - PWV TIME SERIES ON PSS AT DIFFERENT HEIGHTS (FIG. 5B)
 - SECTION ALONG COMPLEX TOPOGRAPHY (FIG. 5C)
- ΔPWV MAPS**: SECTION ALONG COMPLEX TOPOGRAPHY (FIG. 5D) → OROGRAPHIC EFFECT REMOVAL
- HETEROGENEITY INDEX MAPS**: COMPARISON WITH ΔPWV MAPS AND OCCURRED RAIN IN DIFFERENT SITUATIONS (FIG. 6)
 - STATISTICAL VALIDATION + HI IMPROVEMENT

SIGNIFICANCE OF ENCOUNTERED DIFFERENCES

COMPARISON OVER 16 PSS FOR ONE YEAR

2002	AJAC	CAGL	EBRE	GOPE	GRAZ	HERS	MATE	MEDI	NOT1	POTS	RABT	SFER	VILL	WSRT	WTZR	ZIM	MEAN
Mean	-2.9	-3.5	-3.8	-6.2	-3.3	-3.1	-5.0	-4.9	-3.6	-2.9	-6.4	-4.2	-3.2	0.4	-2.3	-2.1	-3.6
Rms	4.2	4.6	4.6	3.7	3.4	3.8	5.2	4.5	5.4	3.6	5.6	4.8	4.4	3.7	3.4	3.3	4.3
Max	30.7	33.1	28.5	19.9	21.6	23.2	36.7	29.8	38.9	14.1	18.9	31.7	45.5	19.3	19.7	31.5	27.7
Min	-23.6	-24.2	-27.5	-22.7	-17.9	-21.8	-35.8	-25.5	-33.8	-21.6	-22.2	-26.9	-24.0	-17.4	-15.1	-20.8	-23.8

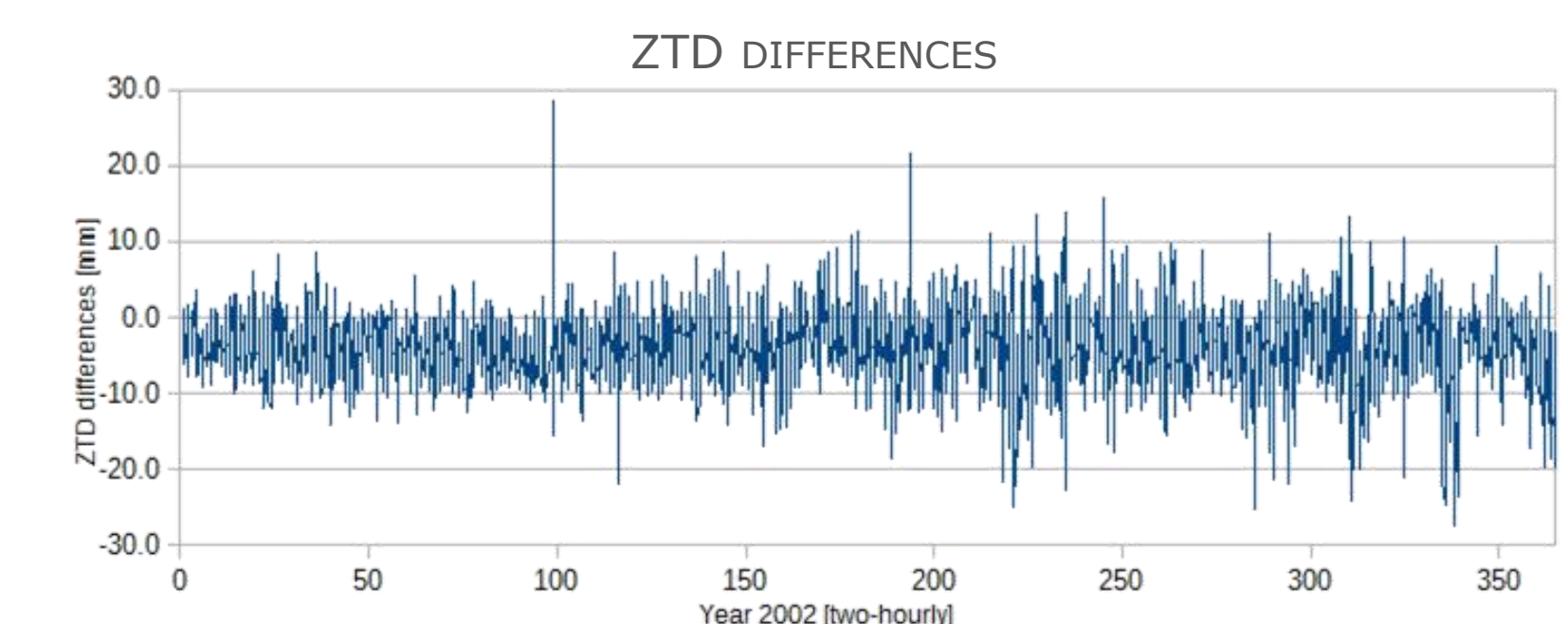


FIGURE 4

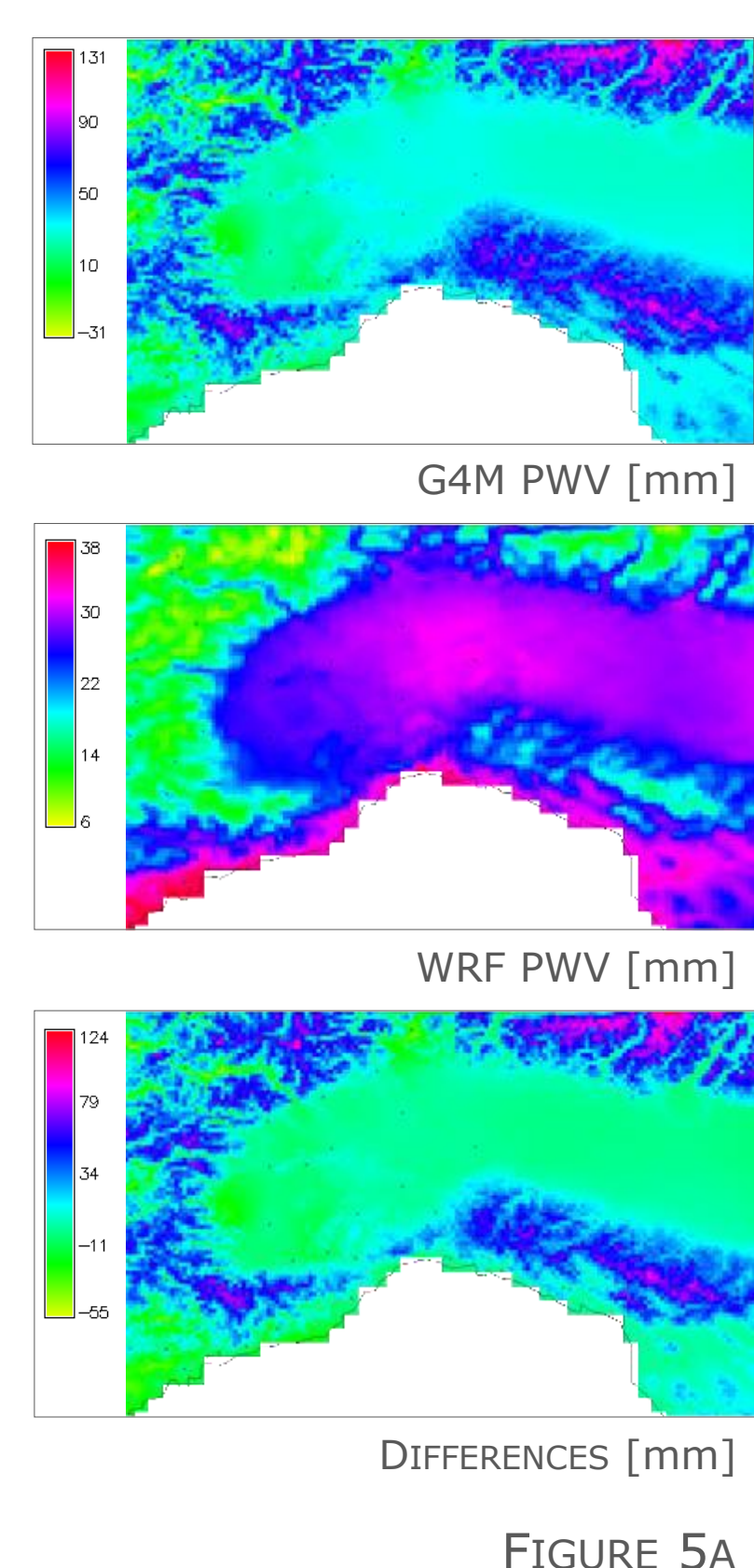


FIGURE 5A

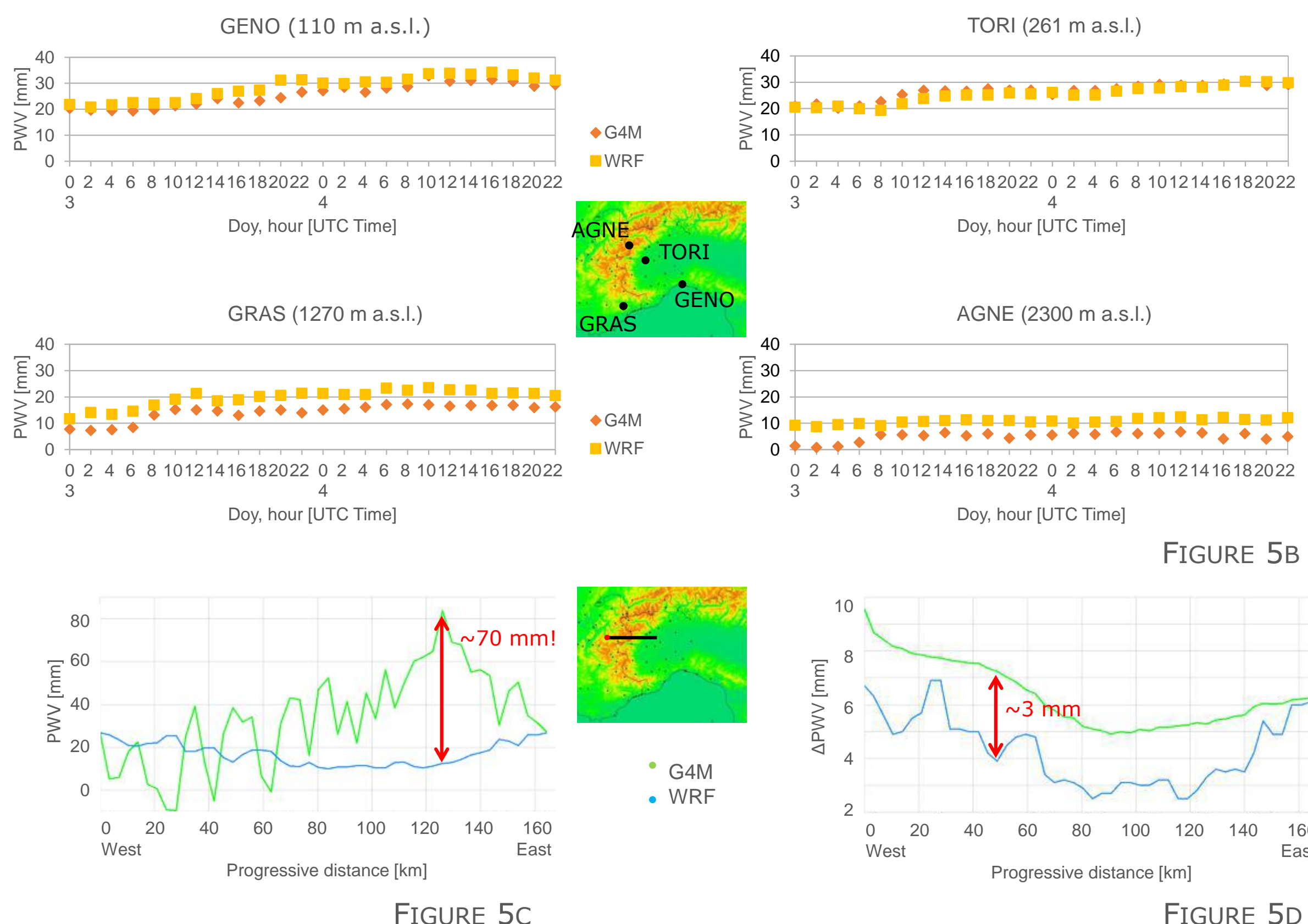


FIGURE 5B

FIGURE 5D

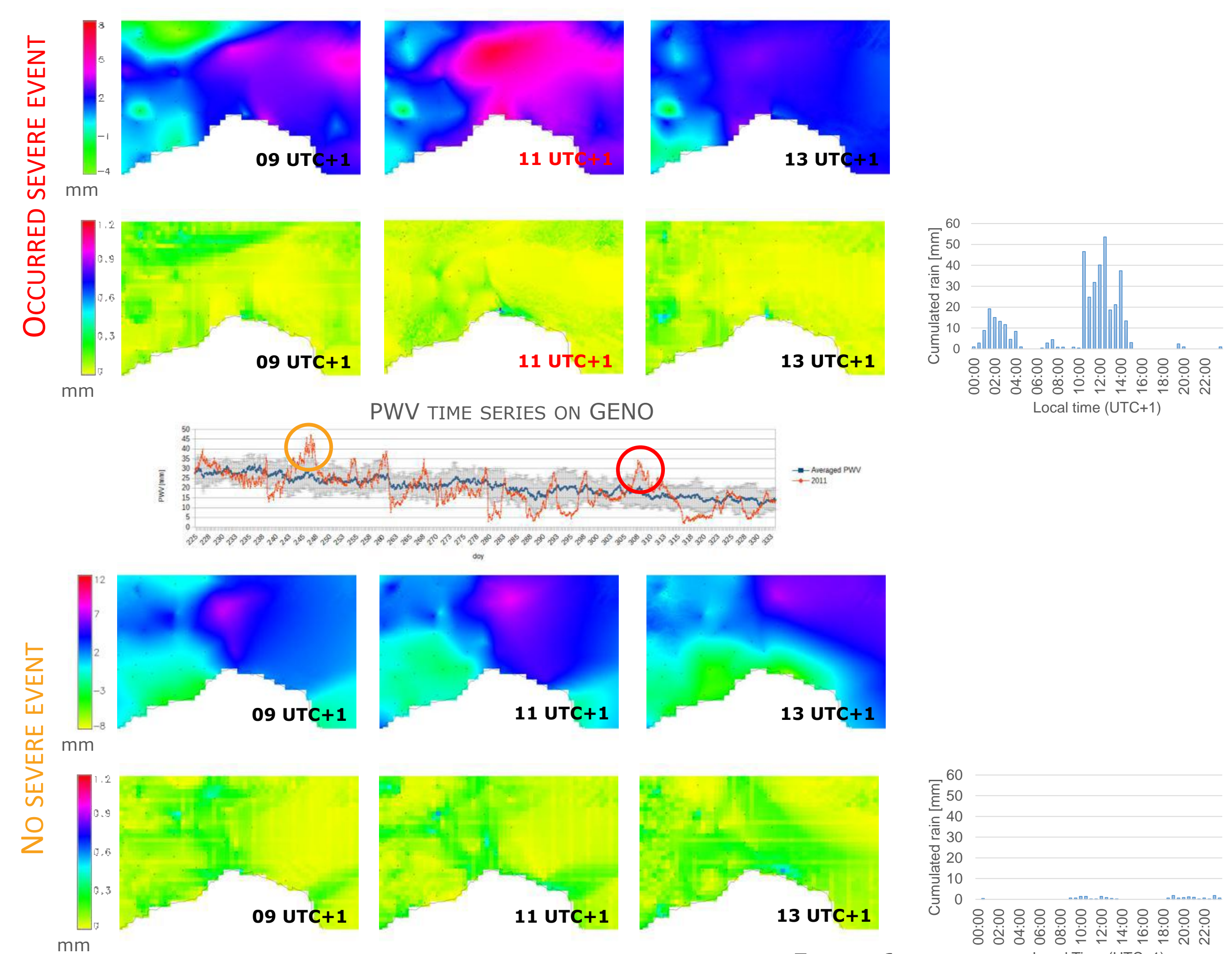


FIGURE 6