1. INTRODUCTION

The horizontal and vertical velocity fields derived from the global \( V_{\text{GLOBAL}} \) solution have been compared to the two regional solutions \( V_{\text{REGA}} \) and \( V_{\text{REGB}} \) (Figure 3).

4. IMPACT ON ABSOLUTE VELOCITY FIELDS

Euler pole rotation is usually used to estimate residues from rigid block motion hypothesis in order to detect strain accumulation area and intra-plate motion. In a first step, the Euler rotation pole of the Western part of the Europe is estimated from the global and the two regional solutions. For each solution, the positions of 40 stations continuously observed during at least 3 years, with a formal error < 1 mm/yr and a post-fit velocity residual <1 mm/yr are used to estimate the rigid block rotation (Table 3).

5. IMPACT ON EULER POLE ROTATION ESTIMATION

For each solution, the modeled rigid block rotation is removed from the horizontal velocities to obtain the residual velocity fields. Such residuals are crucial information to detect non rigid deformation.

The order of magnitude of the residuals is the same for \( V_{\text{GLOBAL}} \), \( V_{\text{REGA}} \) and \( V_{\text{REGB}} \). Nevertheless, we observe systematic effects when comparing them (Figure 4 and Table 3).

6. IMPACT ON VERTICAL VELOCITIES AND GIA MODEL

The model from \( V_{\text{GLOBAL}} \) (resp. \( V_{\text{REGA}} \) and \( V_{\text{REGB}} \)) presents a bias with respect to the model from the global solution \( V_{\text{GLOBAL}} \) of about 0.4 mm/yr (resp. 0.4 mm/yr) with a maximum difference of 0.5 mm/yr (resp. 0.6 mm/yr). This is due to the impact of the reference frame definition on the presented solutions as illustrated in Figures 3 to 5.

The results of the three solutions \( V_{\text{GLOBAL}} \), \( V_{\text{REGA}} \) and \( V_{\text{REGB}} \) are compared to the uplift series obtained from the InSAR analysis (e.g. Bock et al., 2000; Nocquet et al., 2005)

Figure 6 shows the vertical velocities (ranging from 45° to 80° of latitude and -5° to 35° of longitude) as a function of latitude for \( V_{\text{GLOBAL}} \) and \( V_{\text{REGA}} \). The 4th-order polynomial function is fitted to the velocities estimated in \( V_{\text{GLOBAL}} \). The data show that the solution based on the three solutions \( V_{\text{GLOBAL}} \), \( V_{\text{REGA}} \) and \( V_{\text{REGB}} \) has a bias with respect to the model from the global solution of about 0.4 mm/yr (resp. 0.4 mm/yr) with a maximum difference of 0.5 mm/yr (resp. 0.6 mm/yr). This is due to the impact of the reference frame definition on the solutions as illustrated in Figures 3 to 5.

7. CONCLUSIONS

In reason of the extreme sensitivity of a regional GNS solutions to the reference frame, we can conclude that the selection of the reference stations used to express the solution in the global reference frame (ITRF2005) is crucial. In comparison, global solutions are more robust and less sensitive to the choice of the reference stations class than the 2000 solutions and the 0.1 m/yr-level, respectively for positions and velocities.

We highlight that, despite the database of regional reference frame solutions can show biases up to the cm-level with respect to each other and with respect to a global solution. The effect on the absolute velocities reaches up to the 0.1-0.5 mm/yr and affects the regional relative velocity velocities can still be impacted by 0.5 mm.

Consequently, the choice of the reference stations and the geographical extent of the network also has a significant influence on the geodynamic interpretation, e.g. relative pole estimation, and the interpretation of vertical velocities.