Towards a Dense Velocity Field for Central Europe

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Overview

- CEGRN network, objectives campaigns and relation to the EUREF/EPN
- Combination of CEGRN network solutions with EPN densification of ITRF2008
- Preliminary results : residuals of individual solutions relative to the combined solution, and Helmert parameters
- Expected Geokinematics in Central Europe from preliminary data
- Conclusions

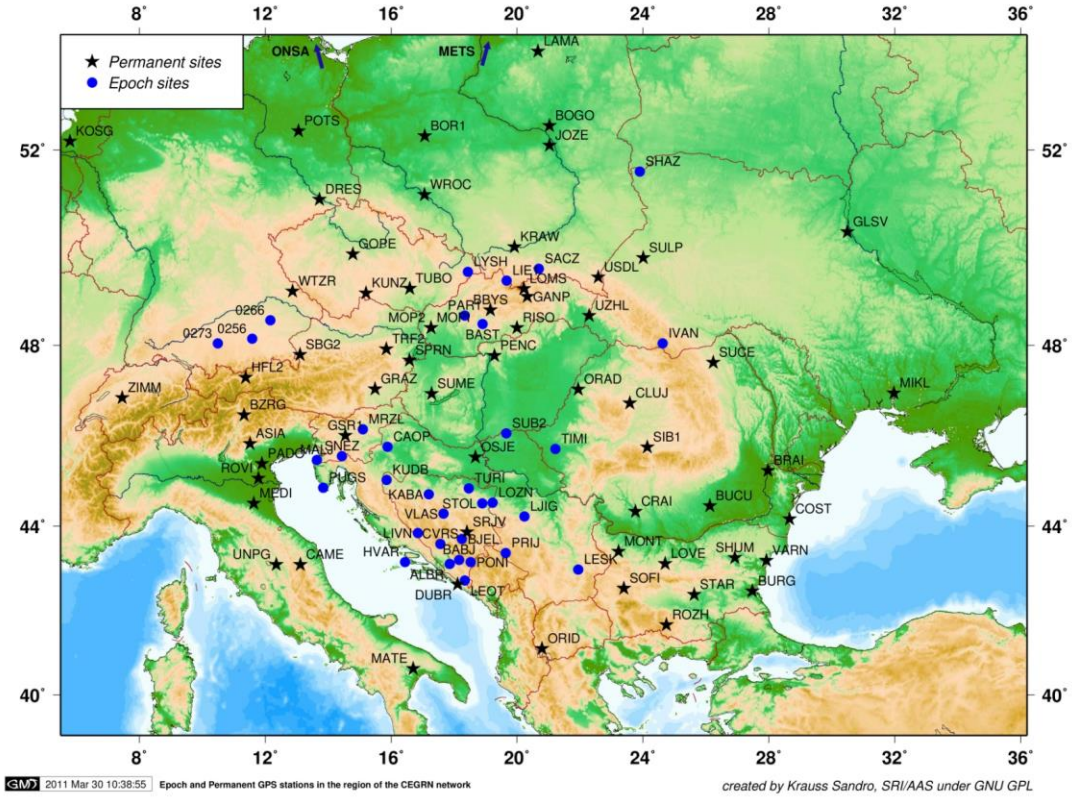
CEGRN – General+Network

International: CEI (Central European Initiative)

13 Countries:

Austria,Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Italy, Poland, Serbia, Slovakia, Slovenia, Ukraine.

CEGRN 2011: CEI Countries + Romania

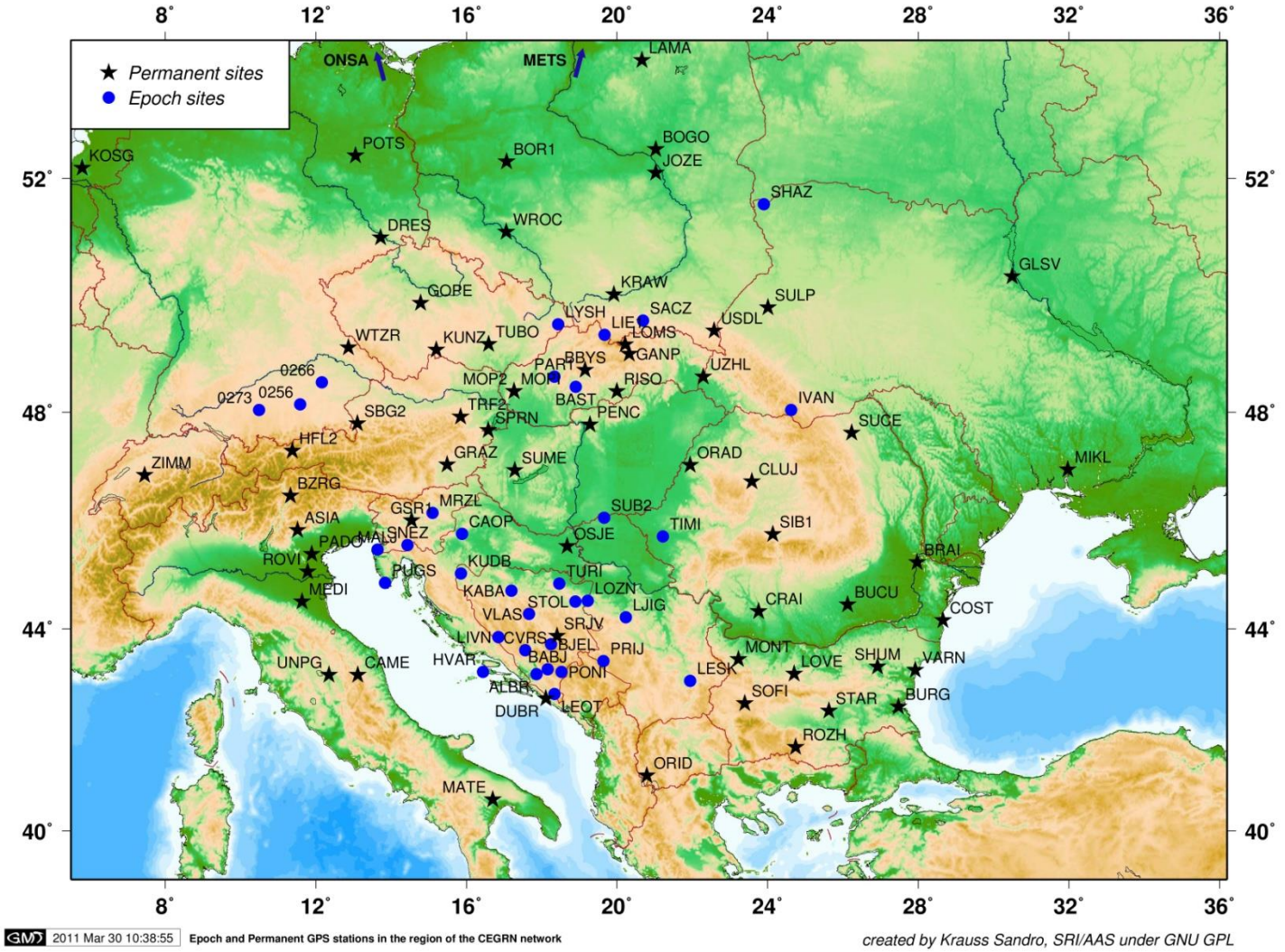


Main Objectives

Modelling of regional intra-plate 3D velocity field at millimetre level

- Combination of solutions of individual analysis centres
- Combination of repeated epoch networks,
  coordinate and velocity estimates
- Evaluation of accuracy and reliability of obtained information
- Velocity maps, regular grid velocities, deformations,
  geo-kinematical interpretations
- Evaluation of statistical significance of derived quantities
- Visualisation of products, geo-kinematical maps
- Strain analysis and detection of velocity changes for
  dynamical investigations and special study areas with
  national or regional densification networks

Status of CEGRN network as to 2011



CEGRN Campaigns

Campaigns	Period	Country	Sites
CEGRN'94	2-6 May 1994	10	30
CEGRN'95	29 May-3 June 1995	11	36+5
CEGRN'96	10-15 June 1996	11	35+6
CEGRN'97	4-10 June 1997	12	35+10
CEGRN'99	14-19 June 1999	13 (extended network)	57 (19P+38E)
CEGRN'01	18-23 June 2001	13 (extended network)	51 (28P+23E)
CEGRN'03	16-21 June 2003	13 (extended network)	51 (28P+23E)
CEGRN'05	20-25 June 2005	14 (extended network)	94
CEGRN'06	12-18 June 2006	Only CGPS	44P
CEGRN'07	18-23 June 2007	14 (extended network)	
CEGRN'09	22-27 June 2009	14 (extended network)	85
CEGRN'11	20-26 June 2011	14 (extended network)	74
CEGRN'13	15-22 June 2013	tbd	tbd

EPN-CEGRN network combination

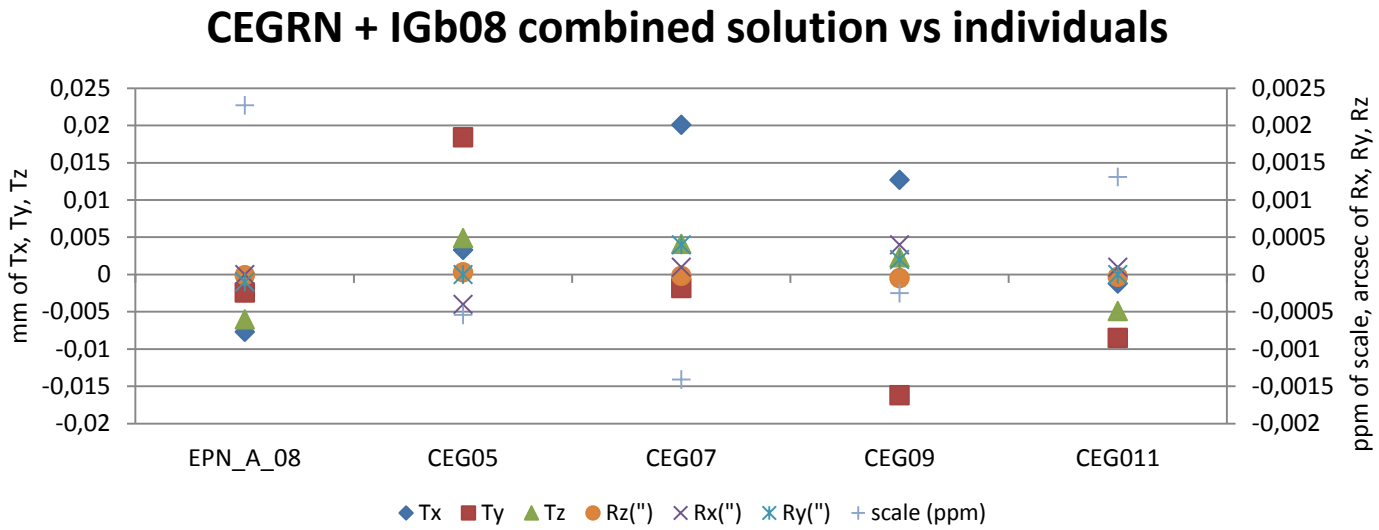
2011 MoU, IAG SC1.3 - WG1 Integration of dense velocity fields into the ITRF

- ADDNEQ2 combine normal equations with MC on the EPN Class A sites (T on pos/vel only; no rotations, no scale nor scale-rate)
- Solution numbers of EPN Class A sites strictly implemented in the .STA file
- Velocity continuous across solution numbers

Normal Equation	Duration	observations	Param.	DoF	Frame
EPN_A_IGb08	2005-01-01 2012-10-21	3348	3349	0	IGS08 frame/orbit(unreprocessed)/PCV
CEGCOMBOLG05	2005-06-20 2005-06-26	6461513	84956	6376557	ITRF2008 frame/orbit (repro1)/PCV
CEGCOMBOLG07	2007-06-18 2007-06-24	8129257	96031	8033226	Same
CEG09TEST	2009-06-22 2009-06-28	1648617	21815	1626802	Same
OLGCEG11	2011-06-20 2011-06-26	1472382	18194	1454188	IGS08 (campaign after wk 1631 = April 2011)

EPN_IGb08 vs ITRF2008(IGb05.atx)

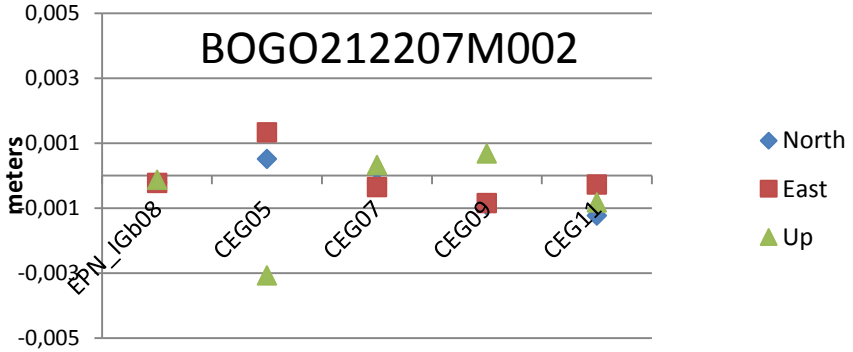
CEG11 and EPN_IGb08 vs previous CEG's

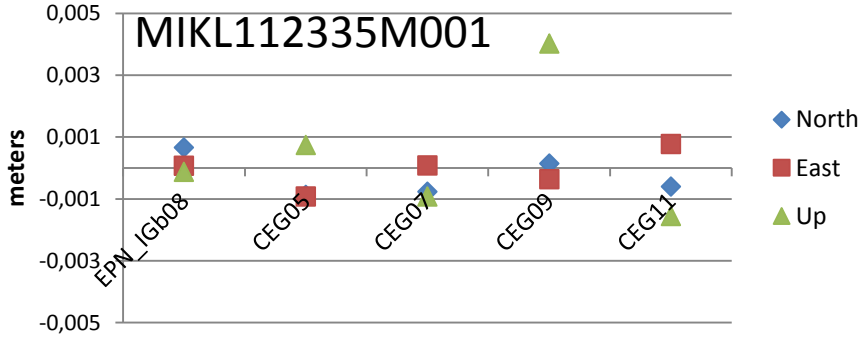


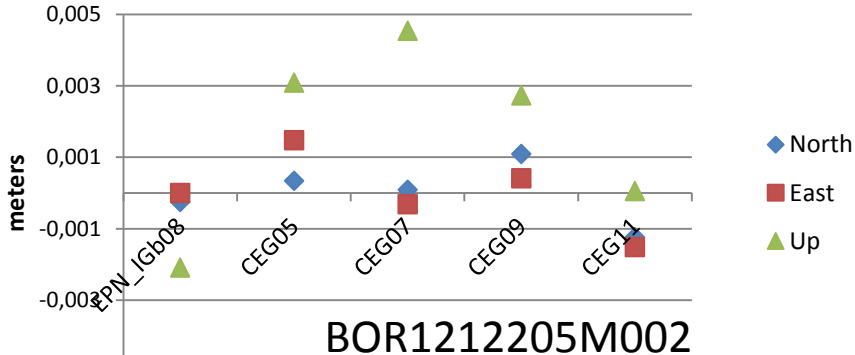
Scale of EPN and CEG11 are from 1.3 to2.3 ppb larger than ITRF2008 solutions

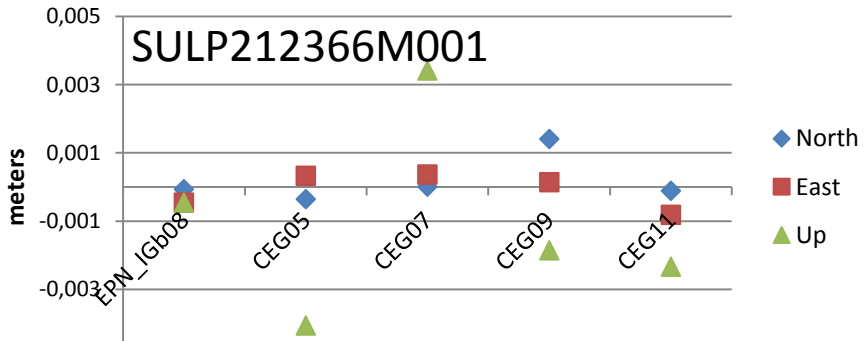
Offsets in time series across wk 1631 (April 2011)?

No apparent jump except UZHL





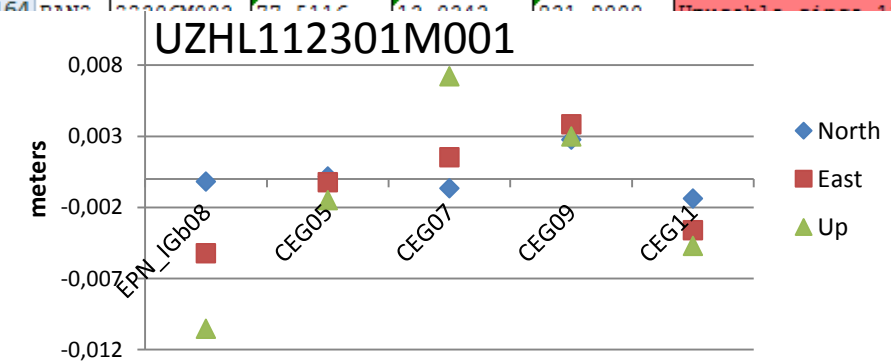


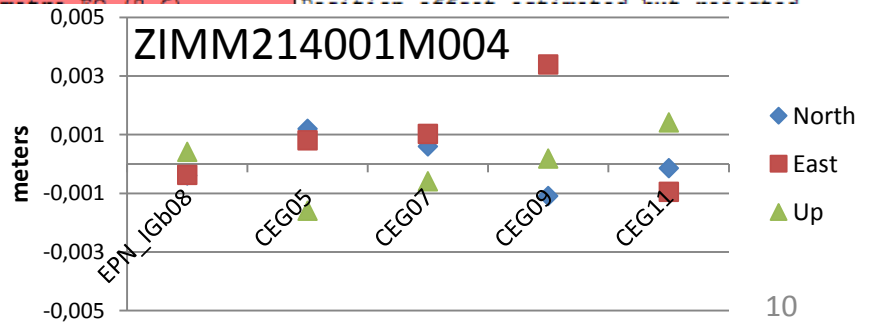


BOR1212205M002

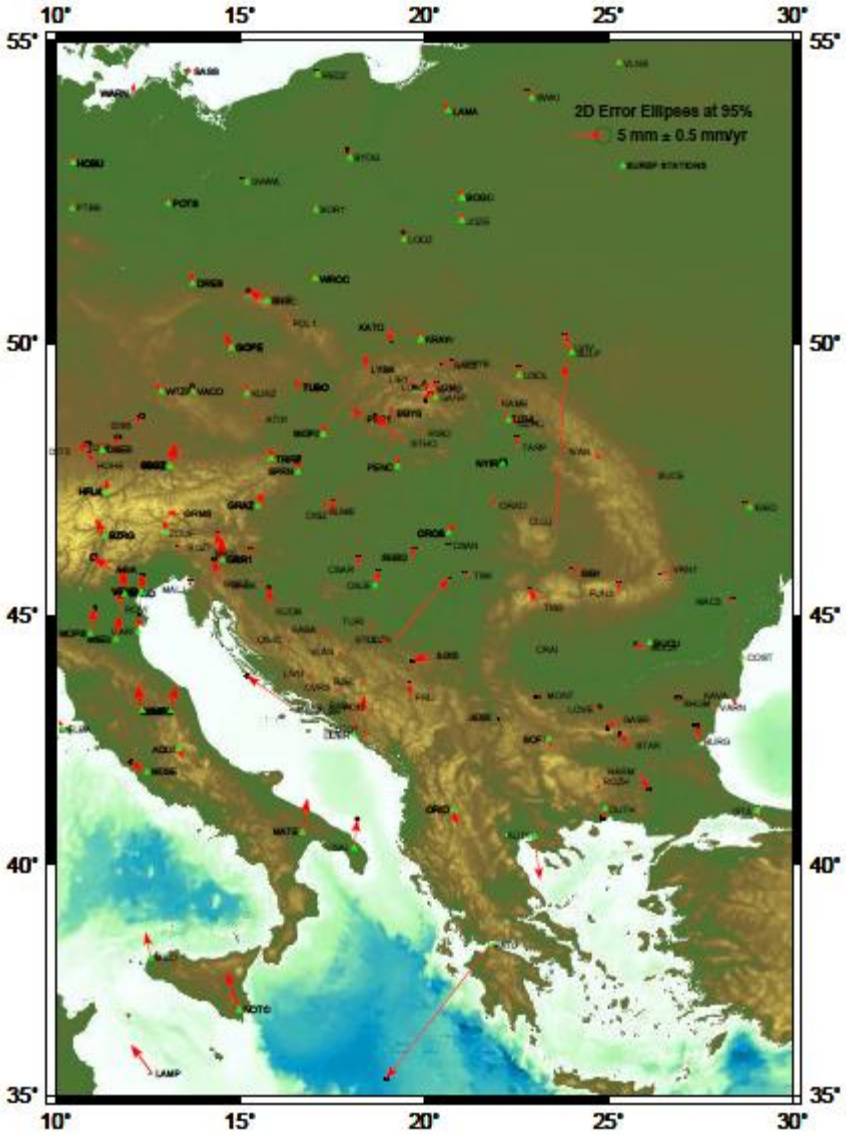
163	UZHL	12301M001	22.2976	48.6320	232.0000	Unusable since 10:354 Antenna change

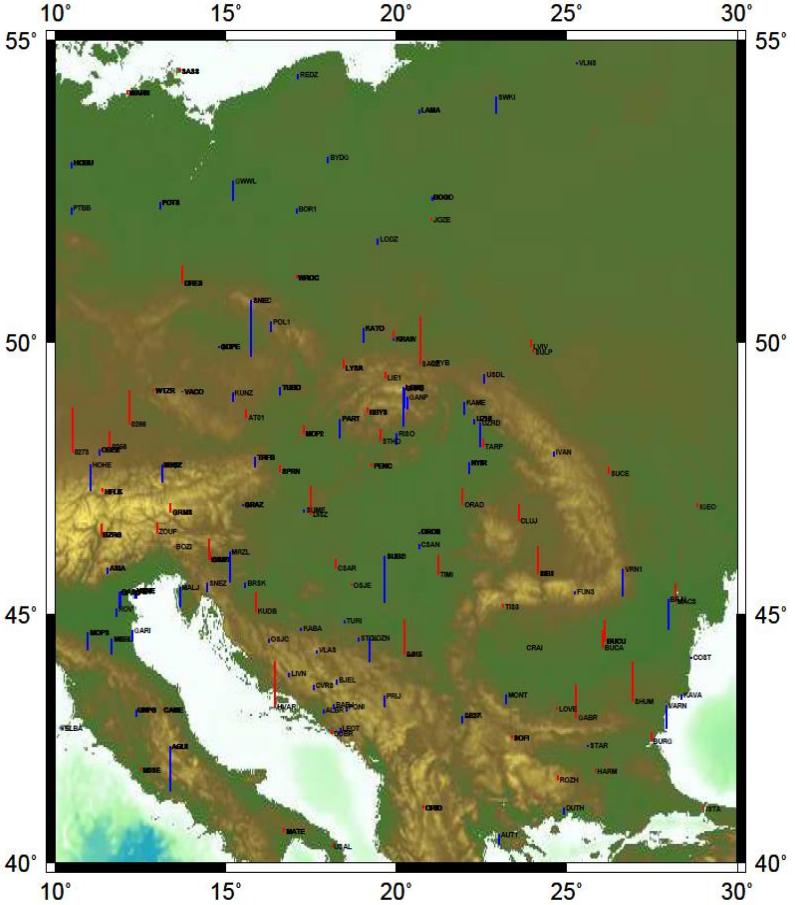
Position offset estimated and validated





Horizontal and vertical velocities



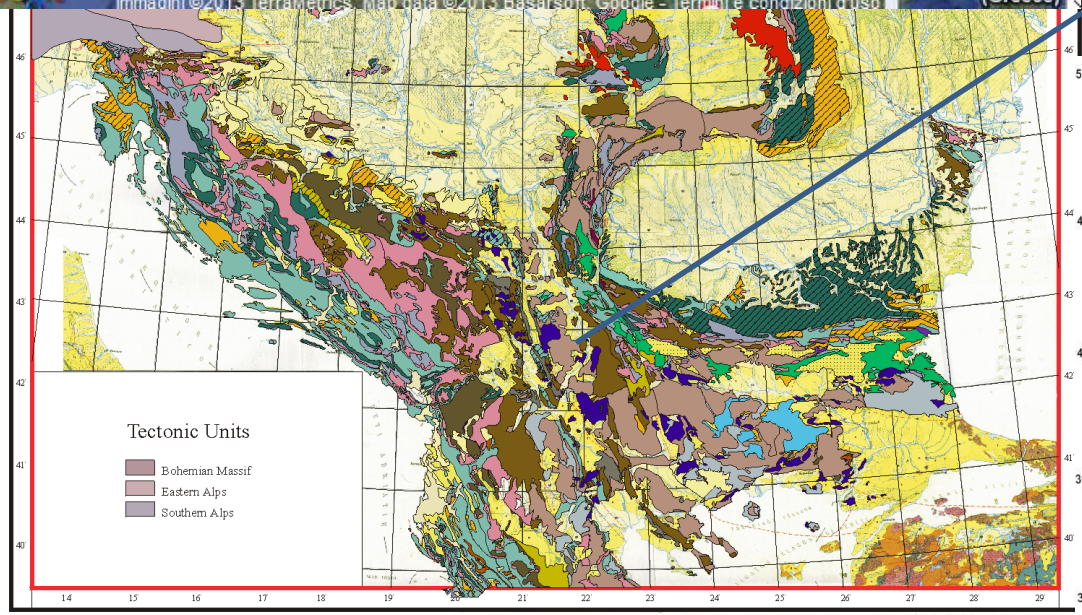


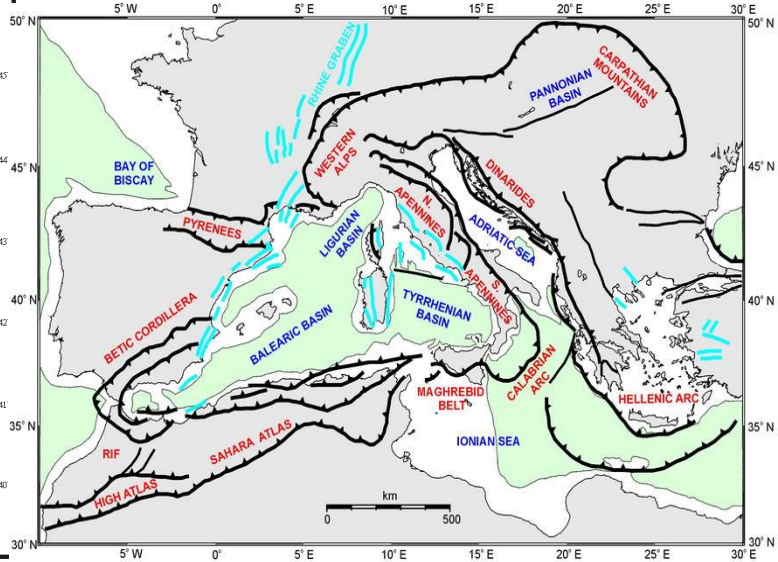
Special cases

- CLUJ: edited out in CEG09
- LOZN vs. STOL : only 50 km apart, but LOZN has a large velocity
- BRAI: noisy time series, was removed
- LESK coincides with A027
- LJIG coincides with A015

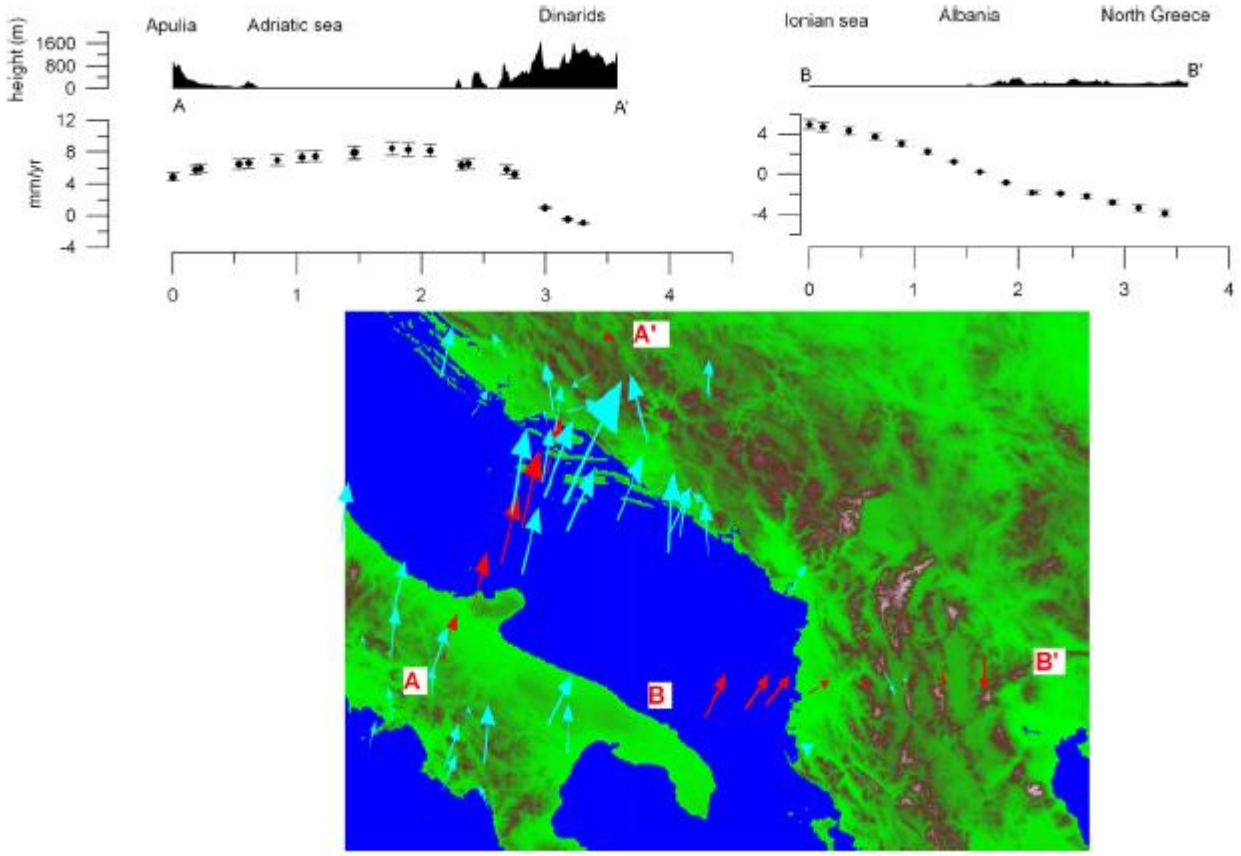
Geokinematics

Dextral mega shear zone?

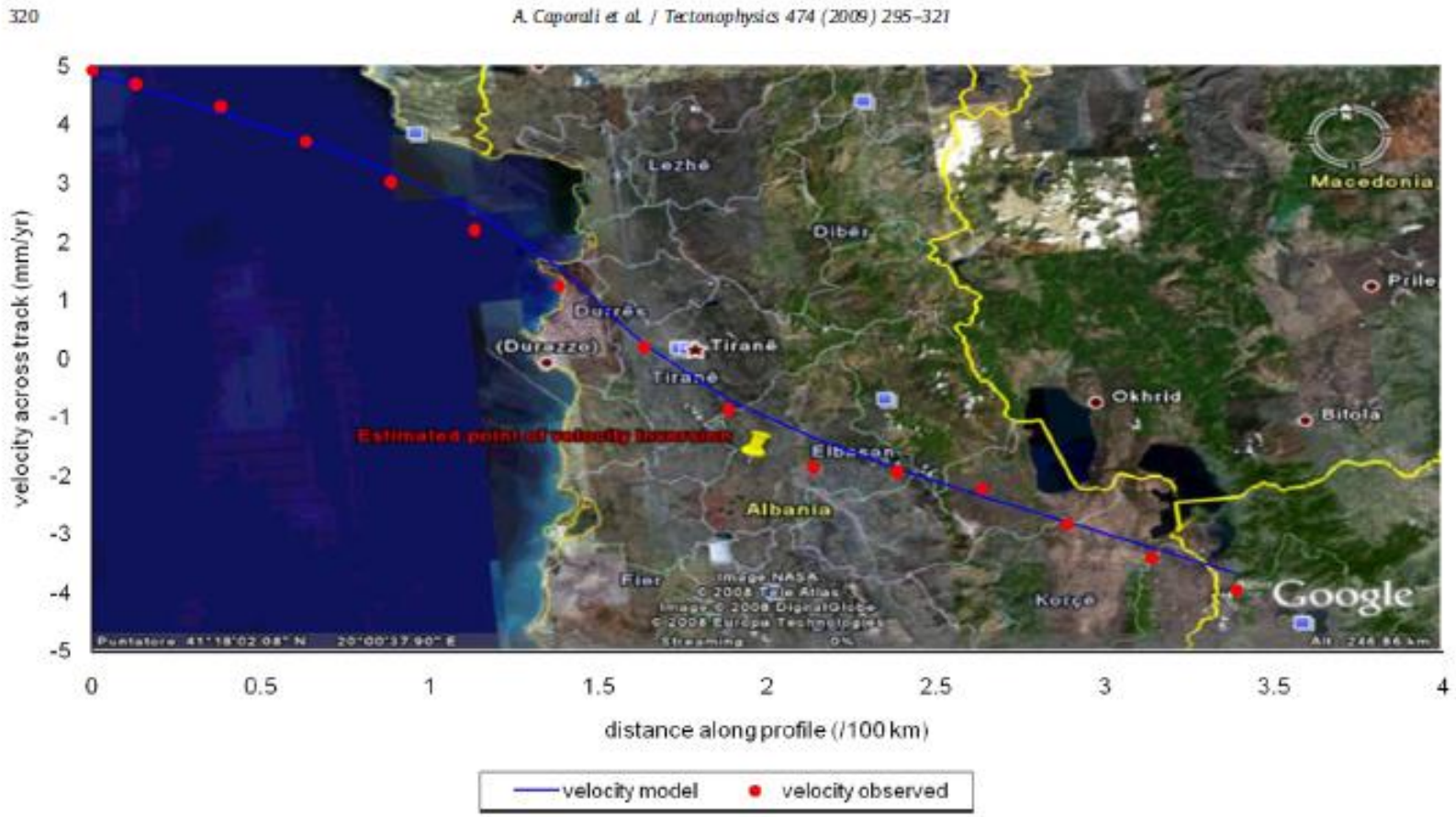




AA’: negative velocity gradient (Adria closing)
BB’ inversion of the velocity (Balkan shear zone)



Geographical localization of the maximum shear area



Conclusions

- Multi year combination of network solutions: a new 4D approach to network densification, as opposed to a static, epochwise densification
- Full consistency requires a clear transition from a consistent ITRF2008 solution to a consistent IGb08 solution
- Individual frames agree with combined frame within 2 mm rms, on average. No discontinuity across wk 1631 → Helmert transformations have probably absorbed the effect of the individual antenna offsets
- Geokinematics: evidence of dextral megashear zone stretching from W Rumania to N Albania
- Reference frame: export ETRF2000/INSPIRE standards to new GNSS sites in Central Europe
- Contribution to the ’IAG Working Group on the Integration of Dense Velocity Fields into the ITRF’