Kinematics and Seismotectonics of the Montello Thrust (Southeastern Alps, Italy)

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Motivation

- Seismicity distribution
- Historical seismicity
- Geological studies
- Deformation
Geology

uplift 0.5-1.00 mm/yr
slip on the blind fault 1.8-2.00 mm/yr

Benedetti et al., 2000, JGR

Galadini et al., 2005, GJI

Barba et al. 2003
“...locked Bassano thrust has a greater seismic potential than the freely slipping Montello thrust”
Kinematics

The Adria-Eurasia geodetic rotation pole implies 1.9 mm/yr of ~N-S shortening across the Montello Hill.
OMBRA Network

10 seismometric stations recording 18 months in 2010-2011

6 GPS sites measured since 2008
Principal axes of the horizontal strain rate tensor estimated from GPS velocities in the polygons (black dashed lines).

Extension in blue
Contraction in red
1σ uncertainties in yellow

The Montello area is characterized by ~60 nanostrain/yr deformation rate.
Instrumental Seismicity

142 events (June 2010 November 2011)

43 out of National Bulletin
Multiplets analysis

Multiplets are seismic events with similar waveforms, when recorded at the same station.

Similar waveforms
  -> common source mechanism

Beyond a particular cross-correlation threshold similar events identify FAMILIES (BridgingTechnique)
Relative Relocation
Focal Mechanisms

Selected 13 events with $M_l \geq 2.0$ and 4 with $M_l \geq 3.0$

6 very good quality FM (strike uncertainties < 20° + residual polarities < 0.025)
Focal Mechanisms

Strike-slip and thrust sources prevail on the west side of Montello

December 2010 Ml 2.2 July 2011 Ml 2.5 Low-angle thrust focal solutions beneath South Alps
Fault parametrization

MT: Montello Thrust

MBT: Montello Back Thrust

BT: Bassano Thrust

VT: Valsugana Thrust
Conclusions

- The deformation across the Adria-Alps boundary is complex and partitioned.

- Earthquake focal mechanisms well correlate with available information about sub-surface geological structures.

- The seismotectonic activity of the Montello shows thrust motion along the basal part of the fault and strike-slip motion crossing the ramp.