International AlpArray science program calls for combined permanent and temporary seismic station array unprecedented in quantity and quality

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Scientific Goals and Interests (1a)

general and locally specific orogenic processes of Alpine-N Dinarides-N Apennines systems

f.e., linkage between orogenic evolution of Alps and N Apennines: mantle flow, roll-back slab dynamics and orogenic growth

SKS splitting

Vignaroli et al. 2008

Barruol et al. 2010
Scientific Goals and Interests (1b)
geutral and locally specific orogenic processes of Alpine-N Dinarides-N Apennines systems
f.e., linkage between roll-back slab dynamics, crustal convergence and evolution of topography

Location of mantle lithosphere delamination
Schlunegger & Kissling 2015
Topographic load
slab load
imposed gravitational load

Profile Engadine along Longitude 10.3E

Pelvoux Profile
Diehl et al. 2009

Lippitsch et al. 2003

Profile above
Profile left
Slab attached
Slab torn
Scientific Goals and Interests (2)
Seismicity and seismotectonics in greater Alpine region

EMSC catalogue 1998 - 2012

f.e., neotectonics in the Friuli area

AlpArray

Nussbaum 2000

Schmid et al. 2004
Scientific Goals and Interests (3)

methodological interests and usage for global studies

methodological improvements of specific seismic methods (f.e., ambient noise seismic tomography; earthquake source parameters definition using consistently identified multi-phase seismic data, ...)

Combination of various seismic imaging methods to improve resolution capabilities for common targets (f.e., establish 3D P-S-anisotropic reference crustal models from combined surface waves-ambient noise-local and teleseismic earthquake tomography, ....)

Incentive to further improve geodynamic modeling (f.e., including 3D geologically realistic top layers for better comparison of plate tectonic scenarios with near-surface geologic record, ....)

usage of AA seismic station array as antennae for global studies
Collaborative Effort by 3 Groups

Earth scientists of all interests
  (f.e., field geologists, geodynamic modellers, geodesists, ...)

Seismologists from Seismological Observatories
Seismologists engaged in temporary field experiments

Boundary conditions to the Seismic Network

- 800 m altitude line of the Alps
- 250 km distance contour ($d_{250}$)
AlpArray Seismic Station Network

Seismic BB (>=30sec) stations permanently operated by observatories

(in total 440+ stations shown on map, focussing only on observatories within AlpArray region)
AlpArray Seismic Station Network

Network of BB stations operated for 2 year period

Stations within $d_{250}$

298 permanent
257 temporary
555 TOTAL

(in addition 20+ OBS in Ligurian sea operated for 6 months)
AlpArray Seismic Station Network

Deployment of 257+ temporary BB stations

AlpArray temporary station plan (22-06-2015)

“compacted” hexagonal

- farthest point at 30 km
- circle centres at 2 * 25.98 km
no void left
AlpArray Seismic Station Network

555 land stations

441 (298) permanent stations
257 temporary stations
  (172 now; 85 next phase)

→ 698 (555) total

Due to availability of temporary BB stations:
We start (Aug 2015) AA Seismic Network from the East using
ALL permanent

+172 temporary

stations by 25 institutions from 12 countries
In addition to the AA Seismic Network there are Complementary Seismic Experiments dedicated to specific targets: f.e. EASI

Eastern Alpine Seismic Investigation

• “Complementary Experiment”
• Summer 2014 – Summer 2015
• 55 stations at 10 km spacing
• ETH (23), IG Prague (20), U. Vienna (8), INGV (4)
• only 5 sites located >3 km from plan
Technical strategy for the mobile seismological components of AlpArray

Recommendations of the AlpArray Working Group 1 Procedures and data management

October 2013

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AlpArray Seismic Network Standards

**hardware**
- truly broadband sensors flat to velocity at min 20Hz – 30s (120s preferred)
- 24bit dataloggers with GPS timing, >130dB dynamic range
- Known response in dataless format
- min sampling rate 100sps
- Huddle tests before deployment

**station**
- Experienced installers
- no vault specified, *just meet noise limits*
- *Realtime communications where possible*. If no real-time, visit every 3 months
- If noise limit is not reached, must be moved within 3 months.
- Stations *within 3km* of planned spot

**data**
- Metadata done by each network / parent EIDA node
- Waveform data: mseed format, transmitted to relevant parent EID
- Data disseminated via EIDA (embargo period)
AlpArray Seismic Network Standards

http://www.orfeus-eu.org/ida/ida.html
Noise Requirements for AlpArray Stations:
PSD targets over high / low frequency bands
AlpArray Working Group is currently established

- Memoranda of Understanding signed by 35+ institutions
- Technical strategy for operation and management defined
- AlpArray seismic network
  - all 441 permanent + 172 temporary stations from East deployment: Summer-Autumn 2015