





The first full vector palaeosecular variation curve for Italy based on revised data from archaeological material and volcanic rocks

Evdokia Tema¹ and Philippe Lanos²

¹Università degli Studi di Torino, Dipartimento di Scienze della Terra, Torino, Italy, <u>evdokia.tema@unito.it</u> ²CNRS IRAMAT-CRP2A, Université Bordeaux-Montaigne and Géosciences-Rennes, Université Rennes 1, <u>philippe.lanos@univ-rennes1.fr</u>

Italian reference archaeomagnetic data



Data from volcanic rocks

In Italy, <u>volcanic rocks from Etna and Vesuvius</u> have been widely used for palaeomagnetic investigations. However, often problems related to their <u>sampling</u>, <u>dating</u> and <u>the</u> <u>strongly magnetized volcanic edifice</u>, may be important.

Data from archaeological artifacts

Archaeomagnetic data from *in situ* <u>baked clays and/or</u> <u>archaeological artefacts</u> can offer well-dated and highquality records. However, they are <u>not continuous, and</u> <u>they mostly cover the last few millennia</u>.

Italian reference archaeomagnetic data

In order to calculate a full-vector geomagnetic field Secular Variation curve for Italy, an updated reference dataset was compiled including archaeomagnetic data from both archaeological material and volcanic rocks.

Particular attention was given at:

- The quality of the reference data
- The reliability of the dating of the volcanic rocks
- The archaeointensity protocols and corrections



Only 57% of the Italian volcanic palaeomagnetic records come from well dated eruptions. For the rest of the data, the traditional age of the eruption has been questioned or changed based on geological evidence and/or archaeomagnetic dating.

Secular Variation curve calculation

The new directional and intensity reference secular variation curves for the Italian Peninsula were calculated based on a total of <u>594 directional and 94</u> intensity high-quality reference data, coming from Italy and nearby countries within a 1000 km radius around Viterbo (red star).

The curves were obtained using the Bayesian statistics for constructing chronologies

(Lanos 2004, Lanos and Philippe 2018, Lanos and Dufresne 2019)

(†)



The directional curve (D, I) was calculated using a spherical approach while the intensity curve was computed separately as intensity values were not available for all directions. Each estimated curve is accompanied by an error envelope expressed at 95% confidence level, defined by a variance deduced from the MCMC (Monte Carlo Markov Chain) calculation process.

New Secular variation curves for Italy





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<u>CONCLUSIONS</u>

A new, <u>full-vector secular variation curve for Italy</u> is presented, based on an updated catalogue of archaeomagnetic records from both <u>archaeological material and volcanic rocks.</u>

The new curves are based on a <u>strict selection of high quality</u> <u>directional and intensity data</u>.

The directional curves are very <u>well-constrained and reliably</u> <u>reconstruct the SV path</u> during the last three millennia.

They show <u>high declination values around 900 BCE</u>, similar to those observed during the Levant Iron Age Anomaly (Shaar et al., 2018).

The intensity curve is characterized by <u>a larger error envelope</u>, due to the lack of data mainly for the 800-200 BC and 600-1000 AD periods, highlighting the need for new high-quality intensity data from Italy

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<u>CONCLUSIONS</u>

Despite the limited number of reference data, the Italian intensity curve offers evidence for <u>high intensity values of around 80 μ T at 800-<u>700 BC and 700-800 AD</u>, in accordance with the geomagnetic intensity spikes previously identified in Middle East and Western Europe.</u>

The new curves can be used for <u>archaeomagnetic dating not only in</u> <u>Italy but also in other countries of Europe</u> such as Croatia, Slovakia and Serbia where no local SV curves are available so far.

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Thank you!

Please do not hesitate to contact us for any further information!





Philippe

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ΒY

(cc)

Evdokia

<u>evdokia.tema@unito.it</u> philippe.lanos@univ-rennes1.fr