Changes to Anastasio et al., SE-2020-184-RC1
Changes based on D. Biardello's review.

Line	
49	suggested change accepted, rewriting from reviewer
53	suggested change accepted, reference added
59	accepted, typo
65	deletion added, manuscript clarified
67	manuscript clarified
80	manuscript change made
93	suggested change accepted
100	suggested change accepted
134--	comment accepted
138	sentence added to caption for figure 5 outlining how paramagnetic and ferromagnetic components for rock magnetic mineralogy are determined.
145	There is no girdle between Kint and Kmin, this has been added to the text for clarification.
183	word choice change, sentence clarified
200	no change as a result of reviewer comment
228	accepted
244	no change made
247	typo fixed
248	suggested change accepted
265	suggested change accepted
267	I've clarified the manuscript text.
278	typo fixed
307	suggested change accepted
312	suggested change accepted
313	suggested change accepted
668	suggested change accepted
711	clarification sentence added to text, references cited
715	suggested change accepted
717	I've changed the figure caption to agree with the figure.
722	suggested change accepted
766	typo fixed
771	suggested change accepted
773	accepted comment, line deleted as

Responses to comments by Ruth Soto

General Comments

1.1 Thank you for the comment. However, the co-authors and myself think the main scientific point of the contribution is the value of AMS measurements in young unconsolidated sediments for orogenic studies. Therefore, we see a manuscript strengthening from multiple examples. Previous studies that have used the Paleomagnetism laboratory at Lehigh University (i.e., Spanish data) and the Archeomagnetism Laboratory at CENIEH (i.e., Italizn samples) including:

(1) Kodama, K.P., Anastasio, D.J., Newton, M.L., Pares, J.M., Hinnov, L.A. 2010. High-resolution rock magnetic cyclostratigraphy in an Eocene flysch, Spanish Pyrenees. Geochemistry,Geophysics, Geosystems, v. 11 p. 1-22 QOAA07 doi: 10.1029/2010GC003069.

(2) Carrigan, J.H., Anastasio, D.J., Kodama, K.P., Parés, J.M. 2016. Fault-related fold kinematics recorded by terrestrial growth strata, Sant Llorenç de Morunys, Pyrenees Mountains, NE Spain. Journal of Structural Geology, v. 91, 161-176. http://dx.doi.org/10.1016/j.jsg.2016.09.003

(3) Anastasio, D.J., Teletzke, A.L., Kodama, K.P., Parés, J.M.C., Gunderson, K.L. 2020. Geologic evolution of the Peña Flexure, Southwestern Pyrenees mountain front, Spain. Journal of Structural Geology. Volume 131, Number 1, paper 103969.

Authors, Kodama, Parés, and Anastasio have an excellent track record in studies using both laboratories and we do not see the use of both laboratories as a reason not to include both field examples.

1.2 Thank you for the comment. It is a difficult question. The magnetic lineation must be younger than the depositional age of the sediments which record it. Therefore, the timing of the lineation cannot be Miocene in age. The AMS is a low strain paleogeodetic indicator that equates to the convergence of Africa and Iberia. It equates most uniformly with the GPS and normal fault seismicity datasets and hence is a paleokinematic indicator The introduction ends with the sentence " In this paper, we show how AMS can extend the temporal reach of GPS geodesy back in time in orogenic studies of the Betic Cordillera, Spain and in the northern Apennines, Italy (e.g., Mattei et al., 2004; Fig. 1)".

Specific comments

2.1 Thank you for the comment. You are correct, figure 7 was incorrect. Figure 3 is correct and figure 7 has been corrected and replotted. The figures now agree as to their number of specimens measured.

Conclusions, lines 297-298. In our opinion, this is a general rule that goes beyond these studies. We go on to say "Stratigraphically controlled AMS measurements are a deep-time, paleogeodetic technique that can be combined with structural geology, GPS geodesy, and seismic data to collectively describe the kinematics of active orogens and to better understand

the nature of seismic hazards. In both the Betic Cordillera (Example I) and northern Apennines (Example II), weak but well-organized penetrative AMS fabrics were recovered from young unconsolidated and unburied rocks that could not be analyzed with more traditional methods."

Technical Corrections

Comment. Balanya added to Martinez-Martinez et al., 2002 in text and references cited.
Figure 3 caption now includes geologic units.
Caption for figure 9 has been clarified.
Caption for figure 10 have been changes. Legend now agrees with figure and caption.