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# Magnetic Fabrics of Impact Breccias from the Chicxulub Impact Crater: Analyses of Thermal and Alternating Field Treatment on the Anisotropy of Magnetic Susceptibility

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We present results of a characterization study of the impact breccias sequence in the Chicxulub multiring structure. Chicxulub formed by a bolide impact some 65 Ma ago into the Yucatan carbonate platform. Chicxulub is the only large multiring structure in the terrestrial record that preserves its ejecta blanket, which includes proximal ejecta and the distal deposits. The global spherulitic-and-clay layer that marks the Cretaceous/Paleogene boundary is related to the Chicxulub impact. Impact excavated a deep transient crater into the Yucatan platform; part of the large volume of fragmented material ejected into the column plume was emplaced as breccias deposits inside the forming crater as column collapsed, also including deposits from ejecta curtain and basal surge flows. Ejecta emplacement involved highly energetic high temperature/pressure processes. Fabric analyses of the ejecta show the relative complexity of the material formed by the impact. The impact breccias and melt have been sampled in the UNAM and CSDP drilling projects. Here we report on fabric analyses of the breccias sampled in the CSDP Yaxcopoil-1 borehole. In particular, we analyze the trend AMS parameters follow in two different processes of demagnetization.

Previous studies of the breccias in the UNAM boreholes documented the presence of an upper sequence of melt-and-basement-clast rich breccias and a lower sequence of carbonate-clast-rich breccias, which could be separated into various subunits with distinct petrographic and textural characteristics.

Samples for this experiment were obtained from the suevitic breccias sequence in the Yaxcopoil-1 borehole. It is located about 62 km from the center of the Chicxulub impact structure in Yucatán. The Yaxcopoil-1 breccias have been subdivided into six units (Stoeffler et al., 2004; Kring et al, 2004). For the alternating field (AF) demagnetization, 8 samples were selected, and for the thermal demagnetization 16 samples. The AMS parameters analyzed include bulk susceptibility K, shape parameter T, corrected anisotropy degree Pj, lineation L, foliation F, and an analysis for the natural remanent magnetization NRM.

K shows an ascendant trend with a irregular behavior in the AF process, while in thermal process, in general K shows a descendent trend with a almost constant behavior. The T parameter, in AF process shows 3 tendencies: first, T has a defined behavior in the oblate and prolate zone. Second, T trends to the prolate zone and third, is that T varies from prolate to oblate zone during this process. While in thermal process, there are three behaviours: 1) some samples show ascendent tendency and others show descendent tendency but, all are oblate ($0<T<1$). (2) Other samples vary from shapes prolate to oblate, from 450º C, all of which are in the oblate zone. (3) Others samples are near neutral zone with some in the oblate zone.

Corrected anisotropy degree Pj. In AF process, it shows 2 groups: one for the samples from unit five and six, Pj is distributed between 1.06 and 1.1 units. Second, for the samples from unit 3 and 4, Pj varies between 1.0 y 1.03. This behavior is similar to igneous and sedimentary rocks behavior. For the thermal process, the majority of the samples show descendent trend with a behavior almost “constant” and the others show a variable trend and the same behavior. All samples are distributed in different intervals of the parameter.

Lineation parameter. In AF, there’re two groups: one, for the unit 3 and 4 L varies from 1.0 to 1.01, and for the units 5 and 6, L varies from1.03 to 1.05, all of which show a regular behavior. In general, thermal process shows tree groups: (1) ascendent trend subdivided in different intervals of L. (2) descendent tendency subdivided in different intervals of L, too. (3) Behaviour irregular with no definitive trend. In AF, foliation parameter shows a similar behavior like L. For the thermal process F shows descendent tendency for the majority of the samples with a irregular behavior, and the rest samples show ascendent trend with irregular behaviour. Finally, the natural remanent magnetization NRM, it isn't a AMS parameter, shows descendent trend and about to 40 mT the fall is evident.While in the thermal process, the NRM display descendent tendency with two behaviours: 1) decrease is almost constant from the beginning and evident from 400ºC. (2) Irregular behavior, the fall is evident between 300 and 500ºC.

In conclusion, both demagnetization techniques give different results, because they provide different information about the sample. It can be observed that with AF process the tendencies in the AMS parameters are better defined than in thermal process.