NEW DATA FOR CHICXULUB TARGET LITHOLOGIES AND EJECTA MATERIAL. B. Kettrup and A. Deutsch, Inst. f. Planetologie (IP) and Zentrallabor f. Geochronologie (ZLG) Univ. Münster, Wilhelm-Klemm-Str. 10, D-48149 Münster, Germany (<kettrup@uni-muenster.de>.

Introduction. The 65 Ma old, 190 km large Chicxulub structure, Yucatan peninsula, Mexico [1, refs. therein], is sealed under a thick cover of post-impact sediments, and hence, considered as a fresh and uneroded crater. The target at the Chicxulub impact sites was a layered with shallow water, thick carbonate platform sediments with sulfate lithologies, resting on a (probably complex) crystalline basement. These facts, and the world-wide presence of in part unaltered ejecta deposits makes Chicxulub an ideal object for all kind of systematic studies related to impact cratering. However, while the post-impact sediments are the reason for the presumably excellent state of preservation, they also hinder access to this crater. Therefore, only geo-physical methods, drilling, and detailed laboratory studies of core material can help to extend the so far restricted knowledge on Chicxulub.

In this context, the geochemical-petrographic analysis of lithic clasts in impact breccias as well as of melt lithologies has turned out as promising approach to better constrain the target, and to determine the relative contribution of different pre-cursor lithologies to the impact melt [e.g., 2,3]. In the Chicxulub case, these rock fragments are recovered from breccias drilled by UNAM and PEMEX [4,5]. Disregarding progress of further drilling (i.e., The Chicxulub Scientific Drilling Project - CSDP), the already existing core samples offer an excellent opportunity to characterize the Yucatan basement in more detail [3]. Furthermore, the investigation of distant Chicxulub material from different K/T boundary sites may enlighten ejecta mechanisms.

Samples, results. We have studied crystalline clasts, separated from Chicxulub impactites of the PEMEX well Y-6 (see [2], for further information). The ejecta material was taken from the K/T boundaries at La Lajilla, Mexico, and Furlo, Italy [6].

Petrography. The original texture of the four crystalline fragments is well preserved. The granitic gneiss fragment of Y-6 N14a shows weakly annealed alkali-feldspar, minor phases are quartz and rutile. Y-6 N14, p4b represents a dark coloured, banded gneiss fragment. Major phases are weakly annealed quartz and feldspars (albite and anorthoclase, minor Na-sanidine and oligoclase)/, subordinate hornblende, pyroxene (high Al and Na), probably garnet, and secondary chlorite occur. The main constituents of the gneiss clast Y-6 N14, p4c are alkali-feldspars, and hornblende; dark mica is completely replaced by chlorite. Minor phases are quartz, sphene, and ilmenite. The about 7 mm large fragment Y-6 N19, p 6 corresponds to other granitic rocks from the Yucatan crystalline basement which occur fairly frequent in the clast-load of the impactites [5]. The clast displays a reaction rim of pyroxen laths, which is a typical feature in impact melt breccias. Y-6 N19, p 6 consists of quartz and albite, with subordinate K-spar and magnetite. The feldspars are strongly annealed, showing checker-board textures. Only a few grains still display the original twinning and anti-parallel intergrowth.

The ejecta material (spherules) from La Lajilla is embedded in a dense limestone (Fig. 1). The impact glass of the spherules is now totally replaced by clay minerals. Numerous cavities in the spherules are filled with secondary clays, and, to a minor degree with carbonate. The ejecta material (spherules) at Furlo is embedded in an about 2 cm thick layer of K/T boundary clay. The well rounded spherules consist of sanidine, glauconite or magnetite [6].

Rb-Sr data (Table 1). Sr isotope systematics for the crystalline rocks, gneisses and the granite Y-6 N14, p 4a, show a high variability, pointing once more to a complex composition of the basement at the Chicxulub target site. The Sr isotope composition, and Rb/Sr of the La Lajilla spherules resembles the characteristics of Chicxulub impactites [3]. Probably, the hydration of the glass did not disturb the Rb/Sr system. In contrast, the Furlo material is comparable to the sanidine spherules from Caravaca, Spain [5], showing lower εSr than Chicxulub impactites [3].

The TUR Sr model ages of the basement lithologies (Fig. 2) cluster at 0.4 to 0.8 Ga, and 1.4 to 1.5 Ga. La Lajilla clay spherules plot in that first cluster. Furlo sanidine spherules have younger TURSr ages, reflecting interaction with and alteration by contemporaneous seawater.

Discussion. Together with the already published information on lithic clasts in Chicxulub impactites, our data point to a rather complex crystalline basement in the Yucatan region. The variations occur within a few meters of one drill core, as well as between core samples from different wells, located at a different distance from the crater center, and in different sectors of the impact structure. Additional data (Sr, Nd isotope ratios, major and minor elements, petrography) of a more complete spectrum of basement rocks, as well as for more samples of melt lithologies are required to get the following information: (i) composition of the sub-crater basement, and it's variation with depth, and in radial directions; (ii) contributions of these different pre-
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cursor lithologies to the impact melt; (iii) formation, mixing and homogenization of impact melts as part of the cratering process.


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Table 1. Rb-Sr isotope data for crystalline clasts in Chicxulub impactites and spherules of the ejecta layers at La Lajilla, Mexico, and Furlo, Italy.

<table>
<thead>
<tr>
<th>Sample</th>
<th>rock-type*</th>
<th>Rb</th>
<th>Sr</th>
<th>87Rb/86Sr</th>
<th>87Sr/86Sr</th>
<th>εUR (65Ma)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y-6 N1, p 4a</td>
<td>gg</td>
<td>96.3</td>
<td>81.8</td>
<td>3.4127</td>
<td>.732676</td>
<td>40.3</td>
</tr>
<tr>
<td>Y-6 N1, p 4b</td>
<td>bg</td>
<td>33.4</td>
<td>287</td>
<td>0.3367</td>
<td>.710169</td>
<td>3.07</td>
</tr>
<tr>
<td>Y-6 N1, p 4c</td>
<td>mg</td>
<td>26.6</td>
<td>113</td>
<td>0.6795</td>
<td>.708356</td>
<td>7.22</td>
</tr>
<tr>
<td>Y-6 N19, p 6</td>
<td>gr</td>
<td>42.7</td>
<td>373</td>
<td>0.3315</td>
<td>.709500</td>
<td>3.01</td>
</tr>
<tr>
<td>La Lajilla (clay)</td>
<td>sph</td>
<td>4.79</td>
<td>37.9</td>
<td>0.3661</td>
<td>.708089</td>
<td>3.43</td>
</tr>
<tr>
<td>Furlo (sanidine)</td>
<td>sph</td>
<td>63.3</td>
<td>21.4</td>
<td>8.5696</td>
<td>.715114</td>
<td>103</td>
</tr>
</tbody>
</table>

gg = granitic gneiss, bg = banded gneiss, mg = mica-gneiss
gr = granite, sph = spherules.

Figure 1. SEM-photomicrograph of a spherule bearing limestone, K/T boundary, La Lajilla, Mexico. The groundmass of the spherule consists of clay minerals, the vesicles are filled with clays or carbonate.

Figure 2. Histogram of TURSr model ages for Chicxulub impactites and target material. Data sources: Basement clasts from Chicxulub breccias, ejecta material (spherules) from Furlo and La Lajilla, this work; C-1, Y-6 impactites and Haiti tektites, [4, refs. therein].