The other two suspected large impact structures (Fig. 1) have central gravity highs and conformally arranged occurrences of metasupracrustal rocks (greenstones) along parts of their periphery, here interpreted as parts of a subsided ring basin. No candidate for a melt rock has so far been identified in those structures.

THE PANTHER MOUNTAIN CIRCULAR STRUCTURE, A POSSIBLE BURIED METEORITE CRATER. Y. W. Isachsen[1], S. F. Wright[2], F. A. Revetta[3], and R. J. Dineen[4], [1]New York State Geological Survey, [2]University of Vermont, [3]SUNY College at Potsdam, [4]Roy F. Weston Company.

Panther Mountain, located near Phoenicia, New York, is part of the Catskill Mountains, which form the eastern end of the Allegheny Plateau in New York. It is a circular mass defined physiographically by an anomalous circular drainage pattern produced by Esopus Creek and its tributary Woodland Creek. The mountain is 10 km in diameter and has a maximum relief of 860 m. It is well displayed on Landsat images and aerial photographs. Pervasive fluvial cross-bedding made it impossible to determine whether the structure is slightly domical, slightly basinal, or unwarped. The circular valley that rings the mountain is fracture-controlled; where bedrock is exposed, it shows a joint density 5 to 10 times greater than that on either side of the valley. Where obscured by alluvial valley fill, the bedrock's low seismic velocity suggests that this anomalous fracturing is continuous in the bedrock underlying the rim valley.

North-south and east-west gravity and magnetic profiles were made across the structure. Terrane-corrected, residual gravity profiles show an 18-mgal negative anomaly, and very steep gradients indicate a near-surface source. Several possible explanations of the gravity data were modeled. Only one of the computed profiles matched the measured values, namely that of a shallowly buried meteorite crater with a diameter of 10 km and a breccia lens 3 to 4 km deep, which would pass through the entire Paleozoic section and perhaps into the crystalline basement. The closely spaced joints in the rim valley are interpreted as the result of differential compaction over the inferred crater rim, leading to bending and dense fracturing of the bedrock. The magnetic profiles show only small variations in intensity over the Panther Mountain area. This is not surprising in view of the significant depth to basement rocks (~3 km) and the low content of ferromagnetic minerals in the overlying Paleozoic section. Regional fracture-controlled linear valleys north and south of Panther Mountain terminate at the rim valley. This is consistent with the inferred breccia lens beneath the structure, which would absorb rather than transmit stresses propagated upward from the basement.

We conclude that the Panther Mountain circular structure is probably a buried meteorite crater that formed contemporaneously with marine or fluvial sedimentation during Silurian or Devonian time. An examination of drill core and cuttings in the region is now underway to search for ejecta deposits and possible seismic and tsunami effects in the sedimentary section. Success would result in both dating the impact and furnishing a chronostratigraphic marker horizon.

GEOMECHANICAL MODELS OF IMPACT CRATERING: PUCHEZH-KATUNKI STRUCTURE. B. A. Ivanov, Institute for Dynamics of Geospheres, Russian Academy of Science, Leninsky Prospect, 38, corp.6, Moscow 117979, Russia.

Impact cratering is a complex natural phenomenon that involves various physical and mechanical processes [1]. Simulating these processes may be improved using the data obtained during the deep drilling at the central mound of the Puchezh-Katunki impact structure [2].

A research deep drillhole (named Vorotilovskaya) has been drilled in the Puchezh-Katunki impact structure (European Russia, 57°06'N, 43°35'E). The age of the structure is estimated at about 180 to 200 m.y. [1]. The initial rim crater diameter is estimated at about 40 km. The central uplift is composed of large blocks of crystalline basement rocks. Preliminary study of the core shows that crystalline rocks are shock metamorphosed by shock pressures from 45 GPa near the surface to 15–20 GPa at a depth of about 5 km [2]. The drill core allows the possibility of investigating many previously poorly studied cratering processes in the central part of the impact structure.

As a first step one can use the estimates of energy for the homogeneous rock target. The diameter of the crater rim may be estimated as 40 km. The models elaborated earlier [cf. 3] show that such a crater may be formed after collapse of a transient cavity with a radius of 10 km. The most probable range of impact velocities from 11.2 to 30 km/s may be inferred for the asteroidal impactor. For the density of a projectile of 2 g/cm^3 the energy of impact is estimated as 1E28 to 3E28 erg (or about 500,000 Mton TNT).

In the case of vertical impact, the diameter of an asteroidal projectile is from 1.5 to 3 km for the velocity range from 11 to 30 km/s. For the most probable impact angle of 45°, the estimated diameter of an asteroid is slightly larger: from 2 to 4 km.

For the homogeneous rock target one may expect 40 cubic km of impact melt. The depth of such a melt zone is about 3 km, so two-thirds of the probable depth of a melt zone seems to be situated in the limit of the sedimentary layer. Shock heating of the water-saturated sedimentary rocks typically does not produce a continuous melt sheet. We need to recalculate the shock attenuation for the specific geology of the Puchezh-Katunki structure to estimate the possible melting in the basement rocks.

One of the most interesting problems relates to the rock deformation history during complex crater formation. In the case of the Puchezh-Katunki structure one can use the level of shock metamorphism of target rocks as a "label" that marks specific points of the target. For an estimated projectile energy, the pressure attenuation curve gives the initial length of a vertical column (of 3 km at the symmetry axis) bounded by the shock pressure 45 GPa and 10 GPa. When the transient cavity reaches a maximum depth, the column seems to be shortened to approximately 1 km.

Numerical simulation of the transient crater collapse has been done using several models of rock rheology during collapse. Results show that the column at the final position beneath the central mound is about 5 km in length. This value is close to the shock-pressure decay observed along the drill core. Further improvement of the model needs to take into account the blocky structure of target rocks revealed by drilling.

The model of collapse allows the estimation of the final position of variously shocked and heated target rocks and the construction of a thermal model of the subcrater space. The comparison of observed