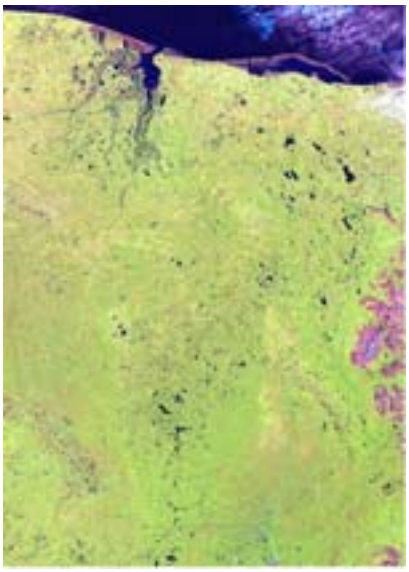
KARA CRATER BY REMOTE SENSING. J. Raitala[1] (jouko.raitala@oulu.fi), K. Ojala[1], T. Öhman[1], D.D. Badjukov[2] and C. A. Lorenz[2]. [1]Physics, Univ. of Oulu, Finland; [2]Vernadsky Institute, Moscow, Russia.

Introduction: The Kara River basin, located between the Pai-Khoi ridge and the Baydarata Gulf of the Kara Sea 200 km to the north of Vorkuta, Russia, was found to be an impact structure in 1970's [1,2]. The 40Ar-39Ar impactite ages vary from 70 to 75 Ma [3,4]. Actually, two craters were suggested [1]: The Kara crater, 60-65 km in diameter, was defined on the Kara River estuary while the 25 km Ust'-Kara crater was suppposed to be mostly in the sea. The impactite outcrops on the Baydarata Gulf shore just to the north-east of the Kara crater were proposed to belong to the Ust'-Kara crater. The competing idea does not find any solid proofs for the Ust'-Kara crater. This would make the deeply-eroded large Kara crater up to 120 km in size [5,6].

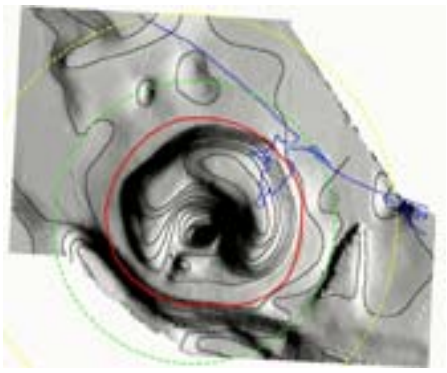
The sparsely inhabited area is important for reindeer herders. Its vegetation is mostly intact with only few signs of old prospecting activities. Only a few fishermen, nenets, and geologists occupy the vast tundra in summertime. The Vorkuta mining area, locating on the lower middle part of the mosaic below, has a population of almost one hundred thousand people while the Ust'-Kara village in the mouth of Kara has only a few hundred inhabitants.



Satellite approach: Our approach focuses on the use of Landsat data (TM 167/11 & 167/12 of July 7th, 2000; the 150 km wide mosaic above) in studying the Kara impact crater and the arctic Baydarata tundra. Erosion has made the Kara structure vaguely discernible in satellite images. On the other hand, the Landsat TM data provides timely correct information of the present state of the key tundra biotopes and ecosystems as well as of important impactite-related locations. Mostly, the satellite data reflects variations in vegetation, soil, wetness, topography, and proximity of the arctic Kara Sea.The adopted remote sensing procedure resulted in map-like outputs to distinguish between various biotopes and to find the tundra vegetation types and their commonness [7].

Topography. Some circularity can be seen in the flat tundra topography cut by Kara river and its tributaries. This may represent remains of a multi-ring impact basin (D1=50 km, D2=120 km; cf. 5). It is not well constrained due to the subtle topographic relief and to hindrances in findind the proposed - but doubted - Ust´-Kara structure the diameter of which has been proposed to vary from 25 to 155 km.

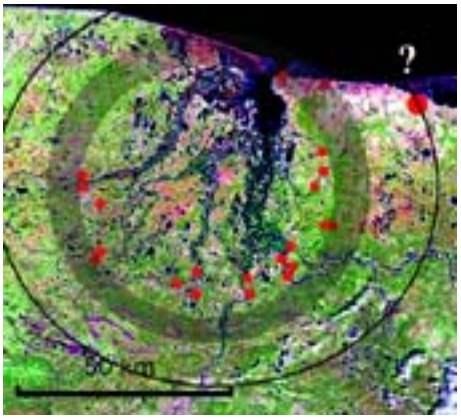
Gravity: The gravity data evidences the large Kara crater without any indications of the Ust'-Kara crater. The data shows a positive central anomaly surrounded by a negative anomaly circle which coincides with many of the impactite outcrops. The previously proposed small Kara crater (red) is surrounded by the positive anomaly highs and the Pai-Khoi ridge which lineate a larger 85 km circle (green) with most suevite outcrops. The yellow 120 km circle coincides with the Syadmayakha suevites [8; see below].



Suevite outcrops - previously known and the new one: The impact crater community has previously known the impactite outcrops within the negative anomaly and at locations close to the Ust'-Kara village. The field work in summer 2001 revealed impactite outcrops 55 km north-east from the Kara crater centre at the Syadmayakha River area. These suevites and the authigenic breccias [2,9,10] may represent the

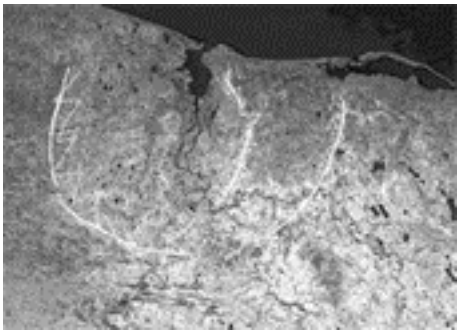
crater floor deposits. Because a triple Kara structure consisting of three separate craters would be very questionable and it is also unsupported by the gravity and other data sets, the simplest explanation for the new observations would be the existence of a single large Kara crater structure, originally around 120 km in diameter.

Syadmayakha impactites are located far beyond the both inner circles and will make the original Kara crater approximately 120 km in diameter. The main impactite outcrops are shown in red.



Landsat TM derivative: The actual TM classification approach has been presented earlier [7] but its futher derivatives will provide interesting new views to the size of the Kara impact crater.

A graphic derivative of the classification (the figure) shows the class commonness within the study area. The most common classes have highest histogram peaks. These histogram peaks are arranged according to their height and the new gray-tone scale is used to display the classification as an image. Brighter pixels represent the more common classes of the wider tundra and they seem also to define the possible inner ring arch and the outer rim ridge of the studied Kara impact crater.



The Landsat TM derivative shows the crater-related ridges (light lines with saw-tooth drawings). The new location of the Syadmayakha impactites was found just from within the wider Kara circle close to the shore in the upper right part of the figure above.

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