

**THE METEORITE FALL IN CARANCAS, LAKE TITICACA REGION, SOUTHERN PERU: FIRST RESULTS.** H. Núñez del Prado<sup>1</sup>, J. Macharé<sup>1</sup>, L. Macedo<sup>1</sup>, H. Chirif<sup>1</sup>, W. Pari<sup>1</sup>, M. Ramirez-Cardona<sup>2</sup>, A. Aranda<sup>3</sup>, R.C. Greenwood<sup>4</sup>, I.A. Franchi<sup>4</sup>, C. Canepa<sup>5</sup>, H.-J. Bernhardt<sup>5</sup>, and L. Plascencia<sup>6</sup>. <sup>1</sup>Instituto Geologico Minero y Metalurgico, San Borja, Lima 41, Perú (hnunezp@ingemmet.gob.pe), <sup>2</sup>Universidad Autonoma, Hidalgo, Mexico, <sup>3</sup>BISA, <sup>4</sup>Planetary and Space Sciences Research Institute, Open University, Milton Keynes, MK7 6AA, UK, <sup>5</sup>Ruhr Universität Bochum, D-44780 Bochum, Germany <sup>6</sup>Antamina S.A.

The meteorite fall that occurred on September 15, 2007, at 16.45 h world time, in the Carancas community, Desaguadero district, south of Perú, very near to Lake Titicaca and the border with Bolivia, is one rare case where it is possible to study both impact phenomenology and meteorite characteristics, including accurate time framework.

The impact occurred on the Puna Plateau, into reddish brown soil 4 to 5 meters thick. This soil covers Cenozoic continental sedimentary rocks (molasses or red beds, siltstones, sandstones and shales) of the Puno group (Palacios, 1993)

The crater is a circular structure lying on the bed border of the seasonal, ephemeral Callacame river. It is composed of a 7.5 m-diameter central hole and a 13.5 m-max diameter, 1 m-max high ejecta rim. The crater, intersecting the phreatic level, has created a shallow (0.6 m-deep water column) groundwater pond in the central part of the geoform. Removed fragments of soil and sedimentary materials occupy mostly the SE part of the ejecta rim. Ejection occurred to a distance of up to 250 m.

Macroscopic observations of fragments of meteorite show fine grained, light grey, fragile rocky material with disseminated mm-sized magnetic particles. The recovered samples showed a striated surface with iron red oxides spots, on a crust formed with country rock material. Petro-mineralogical and XRD studies revealed a typical chondritic structure and presence of CAIs.

The mineralogical composition includes: forsterite (35%), enstatite (30%), diopside (10%) albite (10%); opaque minerals total about 15% and include: kamacite (10%), troilite (5%), and trace chromite and native copper. The chemical composition is Si: 18%, Mg: 14%, Fe: 14%, with minor elements Al: 1.7%; S: 1.6%; Ca: 1.5%; Na: 1.9%, slightly higher relative to previous reported H5 meteorites. The Carancas samples also show traces of Cr, P, K, Cu, Re, and Rh.

Oxygen isotope analysis of the Carancas meteorite was undertaken on a homogenized whole-rock sample by infrared laser-assisted fluorination, following the procedures outlined by [1]. Results of two duplicate analyses ( $\delta^{17}\text{O} = 3.02, 2.94$ ;  $\delta^{18}\text{O} = 4.52, 4.34$ ;  $\Delta^{17}\text{O} = 0.67, 0.68$  (all ‰)) plot within the field of H group ordinary chondrites [2, 3]. Preliminary mineralogical

and textural analysis supports the classification of Carancas as H4/5 [4].

Geophysical prospecting using 200 and 100 MHz Ground Penetrating Radar (GPR) through the crater shows bowl-like deformed reflectors between 4 to 10 m depth.

Some social aspects should be addressed:

Headaches and nausea were reported to have affected some tens of people that approached the impact zone immediately after the fall, "poisonous vapors" being alleged as the cause of the sickness. Water samples, one from the crater and the other from a neighboring hole, were analyzed and showed similar compositions indicating that the meteorite did not add any allochthonous ions. Waters, classified as sodium chlorinate – calcium sulfate, show neutral 7.8 pH, high TDS, and Cl<sup>-</sup> (1204 mg/l), Na<sup>+</sup> (487 mg/l), and Mn<sup>++</sup> (2.6 mg/l) contents. Arsenic was low: 0.02 mg/l. Scientists from the National Health Institute are investigating a sample of people that suffered illness.

People of the local communities claimed the property of the meteorite. The social unrest, increased by the negative influence of commercial dealers, caused a "collective psychosis". A national law is recommended to manage this kind of special event.

The local and international scientific communities are called to give technical support to authorities in order to preserve the crater. The rainy season starts now, in summer, and if no action is taken, direct rainfall and river erosion will destroy the crater immi-

nently.

**References:** [1] Miller M. F. et al. (1999). *Rapid Commun. Mass Spectrom.* 13, 1211-1217. [2] Clayton et al. (1991) *GCA* 55, 2317-2337. [3] Folco et al. (2004) *GCA* 68, 2379-2397. [4] *Met. Bull* 93