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Results of the first field visit to Antipayutinsky gas-emission crater (AntGEC) on Gydan Peninsula, Russia in 2016

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Deep craters in the North of West Siberia are specific objects in permafrost zone first observed in 2014 and later detected on satellite images to form in 2013. Their origin is under discussion yet. Authors hypothesize their formation from gas accumulation and later sudden emission.

Scientific community was informed of Antipayutinskiy gas-emission crater (AntGEC) soon after first Yamal crater was found in 2014. Despite this knowledge, a real opportunity to visit AntGEC with true coordinates and logistic support appeared only in 2016 field campaign.

Our field study of AntGEC included a description of the surrounding area and visible geological section, GPS-survey of GEC settings and related surface disturbances, measuring the depth of seasonal thaw, the internal lake bathymetry and water sampling from internal lake and other "knocked out" ponds. We also looked for traces of the initial mound preceding the GEC formation. We collected the willow branches for tree-ring dating of the events preceding the "eruption" using a specially developed technique, tested on willows, collected from Yamal gas-emission crater (GEC-1).

Based on measurements of the depth, bathymetric map of AntGEC was compiled. The maximum measured depth at the crater center was 3.6 meters. Depth distribution was uniform in plan. The estimated volume of lake water was 1642.6 m^3. Water samples were taken at different depths. The water temperature at the time of measurement was 8.8˚C near the surface and 7.8˚C at a depth of 3 meters.

Preliminary dendrochronological analysis of AntGEC willow from the ejected block with turf showed the age of about 90 years. Annual growth rate of willow on AntGEC location was low (∼0.1 mm) in 1918-1947. An elevated growth rate (0.45 mm) is registered in 1948. This increase is chronologically correlated with previously defined increase of willow growth rate on first Yamal crater location.

A significant difference between Gydan AntGEC and 3 known Yamal GEC is observed. While Yamal GECs are located on gentle concave slopes, overgrown with a more or less dense willow thickets, predominantly in loamy soils, the AntGEC is located almost on the watershed, although near the drainage hollow, in mostly sandy deposits, one of the walls exposes a hilltop sandy section, with windblown sandy depressions. Shrubs even in the bottom of the hollow form separate groups. Only tabular ground ice close to the surface unites Yamal and Gydan GECs. With these new data we need to adjust our understanding of landscape indicators of terrains potentially dangerous in relation to the GEC formation so far based on Yamal GEC study.

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