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Author: Mr. Sergei Nikiforov
Space Research Institute (IKI), RAS, Russian Federation, s.u.nikiforov@gmail.com

Ms. Maya Djachkova
Space Research Institute (IKI), RAS, Russian Federation, a.anikin@np.cosmos.ru
Prof. Igor Mitrofanov

Russian Academy of Sciences, Russian Federation, mitrofanov@1503.iki.rssi.ru
Dr. Maxim Litvak
Space Research Institute (IKI), RAS, Russian Federation, mlitvak.iki@gmail.com

Mr. Denis Lisov
Space Research Institute (IKI), RAS, Russian Federation, lisov@np.cosmos.ru
Dr. Anton Sanin
Space Research Institute (IKI), RAS, Russian Federation, Anton.Sanin@gmail.com

DAN CATALOG OF WATER AND CHLORINE DISTRIBUTIONS ALONG THE TRAVERSE OF
CURIOSITY ROVER

Abstract

The Dynamic Albedo of Neutrons (DAN) is an active neutron spectrometer that measures the content of water, as Water Equivalent Hydrogen (WEH), and neutron-absorbing elements, as Absorption Equivalent Chlorine (AEC), of the subsurface along the traverse of NASA's Curiosity rover. The instrument has operated successfully since August 2012. It consists of a pulsing neutron generator and two detectors for epithermal and thermal plus epithermal neutrons. The sensing depth of the subsurface is 50–60 cm. The results of active and passive DAN measurements along the traverse are assigned to two independent types of pixels: Pixel with Active Data (PAD) which include WEH and AEC content, and Pixel of Passive Data (PPD) which only include WEH content. DAN measurements are represented as regularly sized pixels along the rover's 27-km traverse as a derived data set. Each pixel contains an estimate of the content of the WEH and AEC derived from DAN data collected from August 2012 (sol 3) to December 2021 (sol 3333). DAN measurements are further associated with distinct geological units along the traverse. The absolute maximum of WEH so far is 6.1 ± 0.7 wt.%. It is observed in the DAN passive data in the Sutton Island member of the Murray formation at the 16.3 km mark of the traverse. It is much larger than the maximum of WEH 4.83 ± 0.27 wt.%, as observed at the rover spot at the 23.8 km mark of the traverse according to active measurements. It is located in the Knockfarrill Hill member of the Carolyn Shoemaker formation. According to active measurements, the AEC content ranges from nearly zero to the highest value of AEC 2.56 ± 0.21 wt.%. This maximum is observed at the 6.1 km mark in the Bradbury group.