**Pixel map interpretation of the MSL DAN passive measurements. S. Y. Nikiforov[1]**, M. V. Djachkova[1], I. G. Mitrofanov[1], M. L. Litvak[1], D. I. Lisov[1], A. B. Sanin[1], [1]**Space Research Institute of the Russian Academy of Sciences (IKI), 117997, 84/32 Profsoyuznaya st., Moscow, Russia, nikiforov@np.cosmos.ru**.

**Introduction:** The Dynamic Albedo of Neutrons (DAN) instrument is an experiment onboard the Mars Science Laboratory's Curiosity rover. It consists of neutron generator and neutron detector, which are used to estimate Water Equivalent Hydrogen (WEH) content in a shallow layer of martian subsurface (down to 0.6 m) [1, 2].

The instrument provides two types of measurement depending on the neutron source. Measurements taken with neutron generator are named as Active mode, and measurements taken for intrinsic neutron emission are named as Passive mode.

**Instrumentation:** The DAN instrument uses two methods of active and passive neutron sensing. Active neutron measurements are supported by the pulsing neutron generator (DAN/PNG) that produces 2 microsecond pulses of 14 MeV neutrons at a frequency of 10 Hz. Post-pulse neutron emission is measured in the Active mode. In passive observations, the instrument detects thermal and epithermal neutrons produced by subsurface due to two different exitations: by charged particles of Galactic Cosmic Rays (GCR) and by high-energy neutrons emitted by the rover's Multi-Mission Radioisotope Thermoelectric Generator (MMRTG) [3].

**Data Analysis:** Method of WEH assessment from passive data is based on empirically found correlation between passive and active observations [4]. According to numerical simulation, a size of a measured "spot" during passive observations is about 3 meters in diameter [5,6]. Usage of this technique provides practically continuous profile of WEH variations along the the rover traverse and at stops, see Fig. 1a. But the disadvantage of this method is the complexity in passive data interpretation for testing variations of subsurface water, when the rover's traverse is twisted or when the rover makes a round trips (as an example, see the rover's traverse as white line in Fig. 1b). Thus, several distingwishable peaks at the profile along traverse could be associated with the same local water-rich spots crossed by the rover.

In order to take into account such complex traverse segments, the DAN team suggests to produce the pixel representation of passive data (Fig. 1b). Based on the numerical simulation for a size of radiated area, the individual pixel for data averaging was selected as a square of 6x6 meters.

The distribution of the results obtained in both approaches of passive data evaluation shows good agreement between them (Fig. 2). On the other hand, the pixel mapping of WEH allows to perform much better interpreations of local water-rich spots in correspondence with geo-morphological variations of the surface.

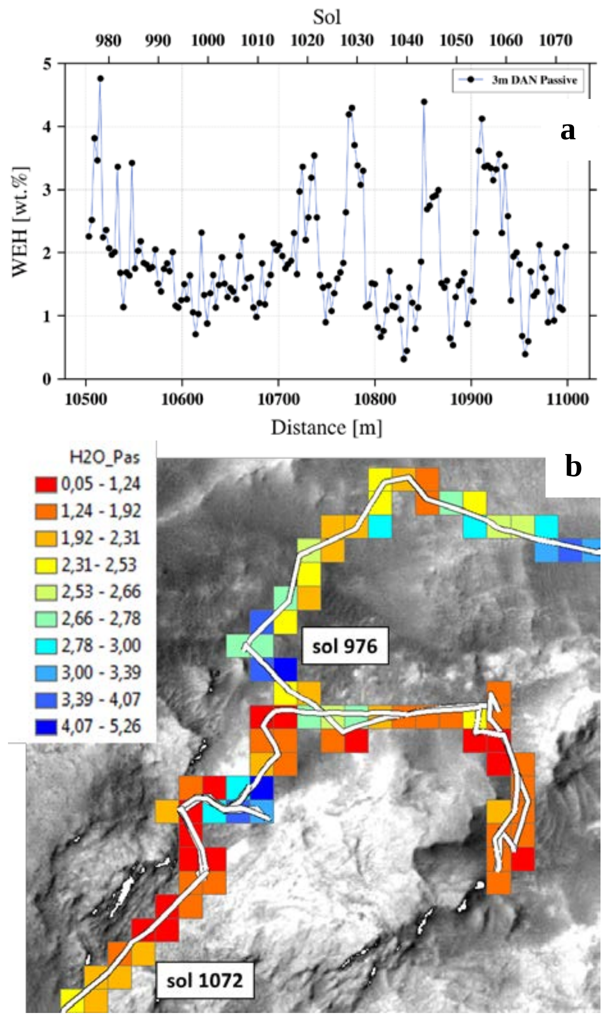


**Fig. 1**. MSL traverse segment for sols 976 – 1072.
**a** – DAN WEH on 3 meters traverse segments.
**b** – 6x6 meter pixel representation of DAN WEH estimations. White line is the MSL traverse [5].

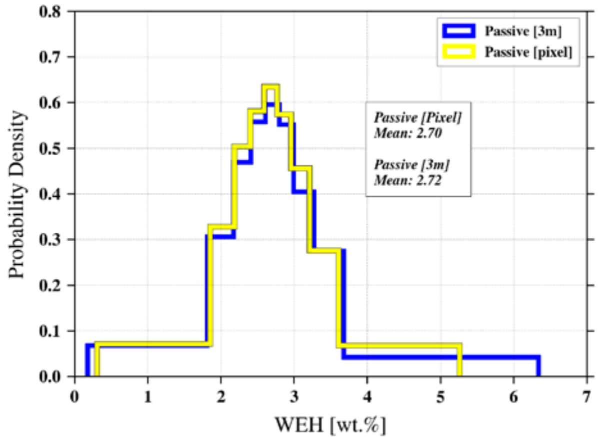


**Fig. 2**. Distributions of WEH content based on DAN Passive measurements up to sol 2911. Blue line shows data with a 3-meter scale resolution. Yellow line shows Passive data represented as pixels. All distribution areas are normalized to 1.

**Conclusions:** The DAN pixel representation can be a useful dataset to analyse the MSL traverse areas in addition to the 3 meter segments method. Two types of WEH estimations from the passive data are consistent and can be used in parallel depending on the analysis type. The DAN team continues to process data, the latest results will be presented at the conference.

**References:** [1] Mitrofanov, I.G. et al. (2012). *Space Science Reviews*, 10.1007/s11214-012-9924-y. [2] Mitrofanov, I.G. et al. (2014). *JGR*, 10.1002/2013JE004553. [3] Jun, I. et al. (2013). *JGR*, 10.1002/2013JE004510. [4] Nikiforov, S.Y. et al. (2020). *Icarus*, 10.1016/j.icarus.2020.113818. [5] Sanin, A.B. et al. (2015). *NIMA*, 10.1016/j.nima.2015.03.085 [6] Lisov, D.I. et al. (2018). Astronomy Letters, 10.1134/S1063773718070034