Quaoar: new, longitudinaly resolved, spectroscopic characterization of its surface
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(50000) Quaoar, one of the largest Trans-neptunian objects, is comparable in size to Pluto's moon Charon. However, while Charon's surface is rich almost exclusively in H_2O ice, Quaoar's surface characterized by ices of CH_4, N_2, as well as C_2H_6, a product of irradiation of CH_4 (Dalle Ore et al. 2009). Because of its distance from the Sun, Quaoar is expected to have preserved, to a degree, its original composition, however, its relatively small size did not make it a prime candidate for presence of volatile ices in the study by Schaller and Brown (2007). Furthermore, based on the Brown et al. (2011) study (Brown, Schaller, & Fraser, 2011. A Hypothesis for the Color Diversity of the Kuiper Belt. ApJL, 739, L60) its red coloration points to CH_3OH as the ice which, when irradiated, might have produced the red material. We present new visible to near-infrared (0.3-2.48μm) spectro-photometric data obtained with the XSHOOTER (Vernet et al. 2011, A&A, 536A, 105) instrument at the VLT-ESO facility at four different longitudes on the surface of Quaoar. The data are complemented by previously published photometric observations obtained in the near-infrared (3.6, 4.5μm) with the Spitzer Space Telescope, which provide an extra set of constraints in the model calculation process in spite of the different observing times that preclude establishing the spatial consistency between the two sets. For each of the four spectra we perform spectral modeling of the entire wavelength range -from 0.3 to 4.5μm- by means of a code based on the Shkuratov radiative transfer formulation of the slab model. We obtain spatially resolved compositional information for the surface of Quaoar supporting the presence of CH_4 and C_2H_6, as previously reported, along with evidence for N_2 and NH_3OH. The albedo at the two Spitzer bands indicates the likely presence of CO and CO_2. CH_3OH, predicted on the basis of Quaoar's coloration (Brown et al. 2011), is not found at any of the four longitudes, implying that the presence of this ice is a sufficient, but not necessary condition for reddening of TNO surfaces. Other ices, in particular CH_4 (Brunetto et al. 2006), have been shown to be plausible precursors for reddening of TNO surfaces.