

AN UNAMBIGUOUS GLOBAL MAP PROJECTION FOR THE KUIPER BELT OBJECT ARROKOTH BY FITTING A QUINCUNCIAL ADAPTIVE CLOSED KOHONEN (QUACK) MAP

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Introduction: On the 1st of January 2019, the New Horizons space probe flew by the Kuiper belt object Arrokoth [1]. Images revealed a bilobate shape that would not allow any common map projection to display the complete surface, because multiple points have the same longitude and latitude. We solve this problem through the application of the Quincuncial Adaptive Closed Kohonen (QuACK) map [2].

The QuACK map for comet 67P/Churyumov-Gerasimenko: Arrokoth shares the feature of ambiguous longitudes and latitudes with 67P/Churyumov-Gerasimenko, the target comet of the Rosetta mission. In order to map the complete surface of the comet, a Quincuncial Adaptive Closed Kohonen (QuACK) map has been fitted to 67P and used for geological mapping [3]. An example is shown in Fig. 1

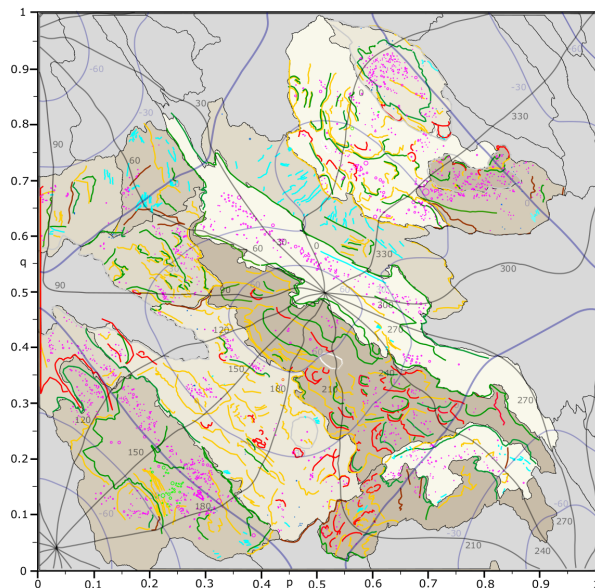


Figure 1: Geological map of 67P in the QuACK projection. The complete surface of the comet is displayed.

Applying the QuACK map to Arrokoth:

Here, we use a shape model of Arrokoth [4] and fit to it a QuACK map similarly as to 67P. The resultant map projection allows to display the complete surface of the body. As example, we project images acquired by the LORRI instrument onto this map.

Conclusions: The QuACK map projection solves the problem of displaying the complete surface of a highly irregular body with ambiguous longitudes and latitudes. It has successfully been applied to comet 67P and the Kuiper belt object Arrokoth

References:

- [1] Sterm, A., et al. (2019) *Initial results from the New Horizons exploration of 2014 MU69, a small Kuiper Belt object*, Science **364**.
- [2] Grieger, B. (2019) *Quincuncial adaptive closed Kohonen (QuACK) map for the irregularly shaped comet 67P/Churyumov-Gerasimenko*, A&A **630**.
- [3] Leon-Dasi, M., S. Besse, B. Grieger and M. Kppers (2021) *Mapping a Duck: Geological Features and Region Definitions on Comet 67P/Churyumov-Gerasimenko*, A&A **652**
- [4] Sterm, A., et al. (2020) *The geology and geophysics of Kuiper Belt object (486958) Arrokoth*, Science **367**.