

CIVILIZATION WASTE HEAT AS A TECHNO-SIGNATURE: INDIRECT MAPPING OF ALIEN ACTIVITY AREAS AND IDENTIFICATION OF FALSE-POSITIVES.

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Earth-like civilizations generate heat from the energy that they utilize. Infrared radiation from this heat can be a thermodynamic technological marker for civilizations.

Recently, we proposed a new strategy for detecting such an alien unintentional techno-signature of Earth-like, Kardashev Type I civilizations utilizing stellar energy on the planetary scale (Kuhn & Berdyugina 2015). We have shown that IR photometric timeseries in two passbands taken during an exoplanetary orbit period may be sufficient to detect such civilizations within a 60 light year volume using a 70m-class telescope like Colossus.

Here we extend the analysis of such series in order to obtain maps of alien civilization activity areas (similar to human urban heat islands shown in Fig. 1) on the planetary surface by applying inversion methods to simulated data. In addition, we investigate how possible false-positive planetary thermal sources (e.g., volcanos and hot springs) can be discriminated through multi-wavelength observations.

References:

Kuhn J.R., Berdyugina S.V. 2015: *Global warming as a detectable thermodynamic marker of Earth-like extrasolar civilizations: The Colossus telescope*, Int. J. Astrobiology, in press

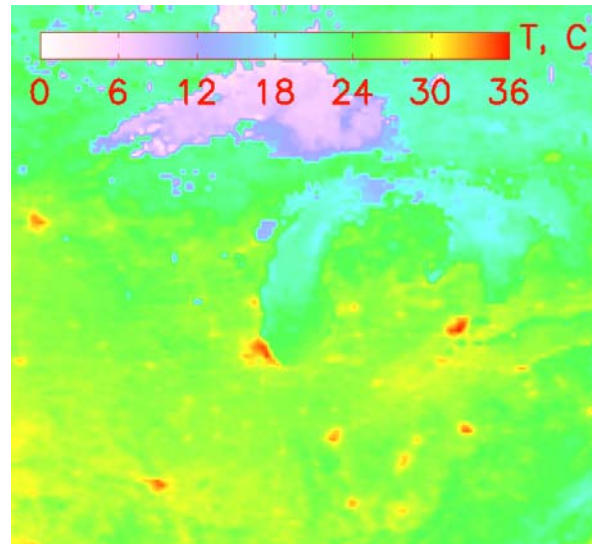


Figure 1: A North America region illustrating a thermal imprint of the human civilization urban activity areas on the planetary environment (urban heat islands) with temperature perturbations up to 10° C.