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Local spacetime dynamics and the PIONEER anomaly

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The propagation of electromagnetic radiation within the heliosphere should be influenced by the dynamics of the local spacetime metric, analogous to the redshifting influence of the cosmological expansion to cosmic radiations. The local metric, however, is an outstanding problem of General relativity up to now. Assuming that the general Robertson-Walker expansion of the universe also takes place on heliospheric scales would lead to a frequency shift of radiosignals, communicated between the PIONEER spacecraft and the Earth, which perfectly explains the observed frequency shift by its magnitude, but not by its sign, i.e. a redshift instead of a blueshift should be expected. Here we investigate some alternatives to the full Robertson-Walker expansion and introduce a local scale function which describes the developement of the local density contrast with respect to the average cosmic density. This function can be trimmed such that the PIONEER anomaly is explained as a local radiophoton blueshift.