New Cosmological Data and the Values of the Fundamental Parameters
IAU Symposium, Vol. 201, 2005
Anthony Lasenby and Althea Wilkinson, eds.

Wrinkles in the Galaxy

Martín López-Corredoira

Instituto de Astrofísica de Canarias, La Laguna (Tenerife), SPAIN

Abstract. New calculations of the Galactic contribution to microwave background radiation anisotropies are carried out and a probable Galactic predominance over cosmological signals at large scales is explored for these frequencies. When we take into account a frequency-dependent contrast of molecular clouds with respect to the Galactic background of the diffuse interstellar medium, the anisotropic amplitude produced by Galactic dust is of the same order as that of the data from the observations. The frequency independence of anisotropies in the microwave range is not necessarily an argument against the Galactic predominance if we take into account an aditional rotational dust emission, for instance. This provides a basis for questioning the validity of considering negligible the Galactic contribution of the microwave background radiation anisotropies. Moreover, the size of the clouds is nearly coincident with that of the structures observed in the microwaves.

López-Corredoira (1999) shows that the Galactic contribution to the microwave anisotropies at large-scale may be as high in amplitude as the total observed anisotropies and its virtual independence of frequency explainable in terms of a combination of several kinds of Galactic emissions. Moreover, the size of the clouds is nearly coincident with that of the structures observed in the microwaves. The Galactic CMBR anisotropies would be due mainly to inhomogeneities in the density distribution of dust in the local interstellar medium at frequencies larger than 50 GHz.

The following main conclusions may be drawn from that paper:

- The extrapolation of anisotropies following the mean dust emission is a bad approximation since it does not take into account the growing contrast of colder clouds in the background of the diffuse interstellar medium. By considering this effect, it is found that dust thermal emission anisotropies are higher than expected by other authors, and that their amplitude is comparable to the observational data at 90 GHz.

- Our ignorance of the different emission mechanisms around 50 GHz (free-free, dust rotational emission, magnetic dipole emission from dust grains) do not allow the firm conclusion that anisotropies due to Galactic emission are not frequency dependent but this possibility remains open.

- If Galaxy-induced anisotropies are not responsible for the totality of the correlations they would at least be a non-negligible part of them, so untrustworthy cosmological conclusions could be reached from microwave background radiation anisotropy analysis unless possible Galactic emission processes are correctly subtracted.

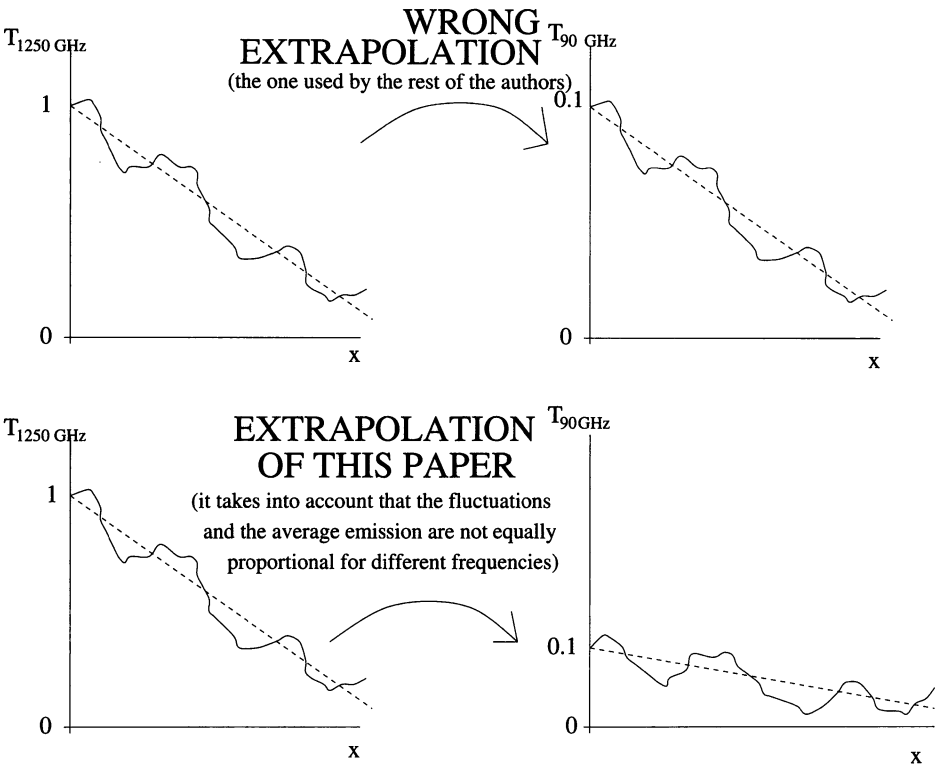

Figure 1. Example of extrapolations for Galactic dust emission. The main difference between the extrapolation of López-Corredoira (1999) and those derived in work prior to this paper is that the latter do not take into account the frequency dependence of the proportionality between the amplitude of the fluctuation and that of the average flux.

- If the Galaxy-induced anisotropies made up the total correlations at microwave frequencies, then inflation, models of Galaxy formation and many parts of the standard cosmology would be wrong. This is not impossible, though there is no firm evidence either for or against it as yet.

References

López-Corredoira, M. 1999, A&A, 346, 369

https://doi.org/10.1017/S007418090021677X Published online by Cambridge University Press