



Canadian Association
of Physicists

Association canadienne
des physiciens et physiciennes

Contribution ID: 2913

Type: **Invited Speaker** / **Conférencier(ère) invité(e)**

A critical analysis of the CMB: constraining CMB physics with peaks, valleys, and saddles

Tuesday 4 June 2019 13:45 (30 minutes)

Data analysis of the cosmic microwave background is often performed by making a map of the sky and then converting that map into its spherical harmonics. This is done because the expectation is that the spherical harmonic coefficients are Gaussian random variables, and the data agrees with this prediction extremely well. In this talk I will discuss a less often used map space approach. The approach requires finding extremal points in a map and stacking images of the CMB temperature and polarization around these points. In general this approach has equivalent constraining power to harmonic approaches though it deals with systematic effects in different ways. I show the simplicity and utility of this technique using specific models. I further extend this approach to include (never before used) saddle points and demonstrate that in certain cases they can be more constraining than extremal points.

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Session Classification: T3-9 Cosmology (DTP) | Cosmologie (DPT)

Track Classification: Theoretical Physics / Physique théorique (DTP-DPT)