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Comparison of cosmology and seabed acoustics measurements using statistical inference from maximum entropy DAVID KNOBLES, STEVEN STOTTS, JASON SAGERS, Applied Research Laboratories, University of Texas at Austin — Why can one obtain from similar measurements a greater amount of information about cosmological parameters than seabed parameters in ocean waveguides? The cosmological measurements are in the form of a power spectrum constructed from spatial correlations of temperature fluctuations within the microwave background radiation. The seabed acoustic measurements are in the form of spatial correlations along the length of a spatial aperture. This study explores the above question from the perspective of posterior probability distributions obtained from maximizing a relative entropy functional. An answer is in part that the seabed in shallow ocean environments generally has large temporal and spatial inhomogeneities, whereas the early universe was a nearly homogeneous cosmological soup with small but important fluctuations. Acoustic propagation models used in shallow water acoustics generally do not capture spatial and temporal variability sufficiently well, which leads to model error dominating the statistical inference problem. This is not the case in cosmology. Further, the physics of the acoustic modes in cosmology is that of a standing wave with simple initial conditions, whereas for underwater acoustics it is a traveling wave in a strongly inhomogeneous bounded medium.

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