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Is it possible to measure the observer's velocity from spectroscopic redshift surveys?

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The peculiar velocity of the observer induces a dipolar signature on galaxy density maps derived from redshift surveys. Following Elkhashab Porciani & Bertacca paper (in prep) [see also Elkhashab, Porciani and Bertacca, Mon. Not. Roy. Astron. Soc. 509, no.2, 1626-1645 (2021), arXiv:2108.13424], in this talk, I focus on assessing the impact of this signature on the multipoles of the observed power spectrum, unveiling an oscillatory signal at ultra-large scales dubbed the "Finger-Of-The-Observer" (FOTO) effect.
To validate our analytical findings, we numerically measure the FOTO signal in the power spectrum monopole using mock catalogues built using the LIGER method. Our results demonstrate the detectability of the FOTO signal, achieving signal-to-noise ratios ranging from approximately 4 to 7 standard deviations for surveys that cover 36% to 100% of the sky. In the second part I explore the feasibility of eliminating the FOTO signal through a radial redshift transformation. In Elkhashab Porciani & Bertacca paper, we find that this correction fails to eliminate the observer velocity imprint due to the persistence of relativistic aberration and magnification effects post-correction. This transformation leads to signal enhancement for surveys with redshifts $z > 0.5$. Finally, we propose a novel method to extract information from the FOTO signal. By measuring the power spectrum monopole from artificially boosted catalogues, attainable through simple redshift transformations, we are able to determine the velocity of the observer or extract cosmological parameters such as the matter density parameter and the equation of state of dark energy.

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