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On the optimal extraction of the Alcock Paczynski signal from voids

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Cosmic voids, large under-dense regions in the Universe, serve as promising laboratories for extracting cosmological information. They offer opportunities to explore deviations from Λ CDM and provide insights into dark energy and modification of gravity. Upcoming surveys like Euclid will enable detailed void analyses, allowing access to a huge number of voids. Voids' significance lies in their spherically symmetric property when stacked, becoming standard spheres. However, observationally, they exhibit two types of distortions crucial for extracting cosmological information: redshift-space distortions (RSD), caused by galaxy velocities, and geometrical distortions, arising from the use of incorrect cosmological models when converting observed redshifts into distances (Alcock-Paczynski test). Current RSD models are insufficient for smaller voids. A new technique, utilizing a reconstruction method based on the Zel'dovich approximation, extends analyses to smaller voids and enhances the precision of parameter constraints.

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