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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 ΛCDM 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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