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The depth of Jupiter's zonal jet-streams as inferred from the Juno gravity measurements

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The Juno spacecraft has been in orbit around Jupiter since July 2016, performing close flybys of the planet every 53 days. Among the measurements performed, the gravity field of Jupiter, determined to high accuracy via radio Doppler tracking, can be used to infer the depth of Jupiter's observed cloud-level wind, and decipher the possible internal flows within the planet. In light of the first orbits with high-quality gravity measurements, we present results for the depth and latitudinal structure of the atmospheric flows on Jupiter. Particularly we focus on the odd gravity harmonics, which reflect asymmetries between the northern and southern hemispheres and therefore are a pure signature of the dynamics with no contribution from the static planet. In order to invert the gravity measurements into flow fields we use an adjoint based inverse model. Results for the wind depth and structure are investigated with several levels of complexity for the vertical and meridional profiles of the deep winds, and statistical tests for both profiles are presented. The results for the flow profile are discussed in the context of theories for Jupiter's flows coming from hydrodynamic and magnetic field constraints.