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A hydrodynamic view on elasticity ANAËL LEMAîTRE, Institut Navier – France, LAURENTIU PASOL, LadHyX – France, XAVIER CHATEAU, Institut Navier – France — Considerable attention was drawn in the recent years on the non-affine displacement fields that accompany elastic deformation of non-crystalline materials. These non-affine displacements bring order unity corrections to the sound speed and Lamé constants that would be estimated using the traditional Born-Huang approximation. Bearing on standard homogenization tools and a compatibility theorem, we provide a simple analytical framework to write exact expressions for the elastic constants. We show that, in the thermodynamic limit, exact microscopic expressions reduce to integrals over the pair correlation function. We next show that the corrective terms may be further reduced to a simple integral involving the Green function of the disordered packing. This brings hope to be able to devise systematic procedures to estimate the real elastic constants of amorphous solids.

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