On the structure of amorphous systems: More order than expected

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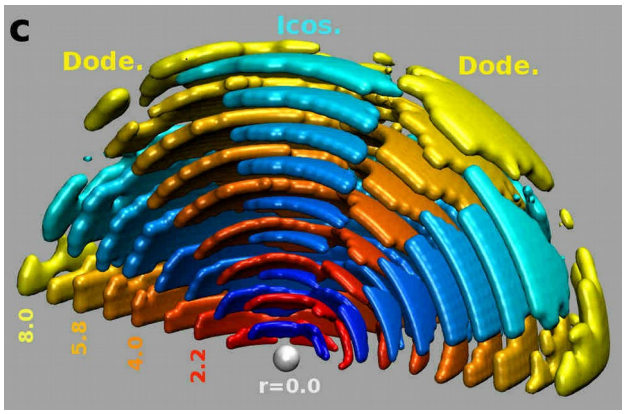
The structure of disordered systems like liquids and glasses is usually characterized by means of the radial distribution function or the static structure factor. Computer simulations or confocal microscopy experiments on colloidal systems allow also to access the bond angle distributions or the local connectivity of the atoms. However, all these quantities are basically one-dimensional in nature and hence it is hard to infer from them the real three dimensional structure of amorphous systems. As a consequence the structure of liquids and glasses is usually considered to be boring for distances beyond the second/third nearest neighbor. In this talk I will show that this is not the case at all and that by considering simple three dimensional correlation functions one finds a surprisingly ordered arrangement of the particles even at significantly larger distances. This order grows quite quickly if the temperature is lowered, showing that amorphous systems are way more ordered than expected from the study of the usual two-point correlation functions.

[1] Z. Zhang and W. Kob PNAS 117, 14032 (2020)



Three dimensional density distribution of a liquid