10. Anomalous water-like properties in a lattice model that has only repulsive interactions

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Water is the most important liquid for the existence of life in our world. It has a huge use in industry and life can exist at low temperatures only due to water's anomalous properties. Water anomalies are at accessible temperature ranges and because of that its anomalies are so important. A lot of models were created to simulate water, but what is necessary for a model to have anomalies is still a question. In continuous models, where the interaction of particles are described by an effective potential, some kind of water anomalies can be presented when the effective potential has a competition of two scales (one of them needs to have attractive interactions). In lattice models the structure is changed and the lattice make possible to have two competing ranges of interaction without attractive interactions. This work considers a two-dimensional model defined on a triangular lattice with a nearest neighbor hard core exclusion and a next-to-nearest-neighbors finite repulsive interaction. This model, that has only repulsive interaction, can reproduce some water anomalies such as density and diffusion anomalies.