

Statistics of Extrema in Large Scale Structure

7 – 11 March 2016@Snellius

The workshop focused on the theoretical modelling of the formation and evolution of objects, halos/galaxies as well as voids, in the cosmic mass distribution on the basis of analytical descriptions. Prominent in these are the peak model and the excursion set model, both of which allow to predict on the basis of Gaussian statistics of the primordial density field what objects emerge at which epoch, and what their mass spectrum and distribution of other properties are. Over the past years, there has been a substantial advance in these models, largely supported by computer models and simulations and the availability of large datasets of galaxy surveys.

To this end, the workshop brought together some 25 experts on different aspects of analytical modeling of the cosmic mass distribution. Particularly noteworthy was the presence of Nick Kaiser and Alex Szalay, two authors of the seminal paper in this field, BBKS from 1986 (regretfully, prof. J.R. Bond at the last moment had to refrain from participation). The setting of the Snellius Center proved ideal for the highly interactive workshop, involving numerous discussions between (groups) of participants. The program involved a range of (review) talks that set the framework for the subsequent open discussion sessions. The size of the participant group and the glass desk cubicles encouraged this interactive atmosphere.

The first day of the workshop centered on the central topic, the identification of peaks in the primordial density field with emerging objects, both in terms of simulations (e.g. Porciani) as well as in the discussion on several analytical (galaxy) bias models. The second day centered on voids, the underdense regions in the cosmic mass distribution, while the third day centered on analytical and geometric models of the dynamics and evolution cosmic web. Also impressive results were presented on the success of accurate mathematical models for the evolution of the statistical properties of the cosmic mass distribution centered on the fourth day, in particular in the contributions C. Uhlemann and S. Codis. The connections with observational data were the subject of the fourth day, both in terms of simulations as well as from a pure observational perspective (M. Takada). The workshop also included a special review by Miguel Aragon-Calvo, supported by the e-science center. His combined expertise in cosmology, cosmic structure formation and scientific visualization had prodded us to invite him in order to allow the support of state-of-the-art visual techniques in guiding the development of theoretical models.

In summary, the workshop provided a highly successful and inspiring forum for extensive discussions on a range of – in principle – technical and mathematical issues. It established firm links with simulations, and for applying the developed analytical models to large upcoming cosmological surveys. In all, an appropriate celebration of 30 years BBKS, one of the targets of the meeting !

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Ravi Sheth (Philadelphia, United States)

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