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Pushing the frontier of ICM physics with novel observations : new SITELLE observations of the filaments in the Perseus cluster

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Clusters of galaxies exhibit some of the most spectacular examples of optically bright, line emitting nebulae. These nebulae surround the central galaxies, are filamentary in nature and can extend over 100 kpc in size. Recently, Gendron-Marsolais et al. produced for the first time a detailed velocity map at optical wavelengths of the giant filamentary nebula in the Perseus cluster and revealed a previously unknown rich velocity structure across the entire nebula. These observations were obtained with the optical imaging Fourier transform spectrometer SITELLE at CFHT, which has an outstanding field of view of 11 arcmin by 11 arcmin. Here, we present new SITELLE observations of NGC 1275, taken at 4 times higher spectral resolution compared to the initial SITELLE observations. These data reveal in remarkable detail the kinematic and quiescent nature of the filaments. They also suggest that there are 2 distinct formation mechanisms for the creation of filaments: one responsible for the large-scale filamentary nature of the filaments, as well as a distinct and more turbulent mechanism that gives rise to filaments in the wake of X-ray cavities.

Author: HLAVACEK-LARRONDO, Julie (Université de Montréal)

Presenter: HLAVACEK-LARRONDO, Julie (Université de Montréal)

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