Contribution ID: **148** Type: **Oral presentation**

The landscape of flavor composition of high-energy astrophysical neutrinos

Monday, 26 October 2015 14:20 (20 minutes)

IceCube has confirmed the existence of the long-sought high-energy astrophysical neutrinos. Recently, the flavor composition of the diffuse flux, that is, the proportion of electron-, muon-, and tau-flavor in it, was measured for the first time. This rich observable can reveal information about physical conditions in the production, propagation, and detection of neutrinos, including whether there is new physics involved. We present theoretical expectations for the flavor composition at Earth by exploring all possible flavor compositions that leave the astrophysical sources. We explicitly show that the region of accessible flavor composition at Earth is surprisingly small, regardless of the neutrino mass hierarchy and of the experimental uncertainty on the mixing parameters. This remains true even in the presence of a broad class of new physics effects during propagation. Furthermore, we are able to clearly identify what regions of the flavor space can be accessed only by new physics, and of what type. In particular, in the case of neutrino decay under a normal mass hierarchy, we demonstrate the usefulness of the flavor composition by using the present IceCube results to improve the bounds on neutrino lifetimes by several orders of magnitude. The planned volume upgrade, IceCube-Gen2, would be able to strengthen these claims.

Primary author: Dr BUSTAMANTE, Mauricio (Center for Cosmology and Astroparticle Physics, The Ohio State University)

Presenter: Dr BUSTAMANTE, Mauricio (Center for Cosmology and Astroparticle Physics, The Ohio State University)

Session Classification: Neutrinos

Track Classification: Neutrino physics