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An interplay of small- and large-x effects in the QCD predictions for prompt atmospheric neutrino flux at IceCube

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The predictions for the atmospheric neutrino flux at high energies strongly depend on the contribution of prompt neutrinos, which are determined by the production of charmed mesons in the atmosphere at extremely high energies and very forward rapidities. Study of charm production in the far-forward directions requires to deal with a very asymmetric kinematics configuration with extremelly small-x on one side and very large-x on the other. Therefore model predictions for charm cross section known as the state of the art for midrapidity regions have to be supplemented here by dedicated small- and large-x effects. In this talk I will present our estimations of the related cross sections, recently obtained and discussed taking into account the presence of an intrinsic charm (IC) component in the proton wave function at large-x and the QCD dynamics modified by the onset of saturation effects at small-x. In this study the impact on the predictions for the prompt neutrino flux is investigated assuming different values for the probability to find the IC in the nucleon (Pic). We demonstrate that for Pic ~ 1%, the IC component dominates the high-energy prompt neutrino flux. A first comparison with the IceCube data is performed and upper limits on the amount of IC are obtained for the linear and nonlinear descriptions of the QCD dynamics.

[1.] V.P. Goncalves, R. Maciula and A. Szczurek,
"Impact of intrinsic charm amount in the nucleon and saturation effects on the prompt atmospheric ν_μ flux for IceCube",
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