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Searches for NSI and Sterile Neutrinos with ANTARES and KM3NeT

The Mikheyev–Smirnov–Wolfenstein (MSW) effect is one of the key insights that helped form our current understanding of neutrino oscillations. Neutrinos interacting coherently with matter experience a form of refraction and oscillations in dense media can be a powerful tool to explore physics beyond the Standard Model. Atmospheric neutrinos, in particular, can make use of the entire Earth to probe for new physics effects in the pattern of neutrino oscillations. Neutral-current Non-Standard Interactions (NSI) would contribute directly to the matter potential in neutrino oscillations, while mixing between active and light sterile neutrinos may be enhanced by these matter effects. In order to tap into this outstanding natural resource, neutrino telescopes deploy Mton scale active volumes that are required to scan the oscillation space in both energy and baseline independently. In the Mediterranean Sea, the ANTARES neutrino telescope has been taking data since 2008, and its successor KM3NeT is currently under construction with a volume equivalent to ANTARES itself already deployed. In this contribution we will discuss the latest results from ANTARES and KM3NeT in search for physics beyond the Standard Model using atmospheric neutrinos. In particular, we will present results with 10 years of ANTARES data of searches for sterile neutrinos and NSI, and show updated estimates of the sensitivities of KM3NeT to these new physics scenarios.

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