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**A New Approach to an *In situ* Study of Neutral Atomic Fluxes in the Solar System**

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A new approach to *in situ* measurement of low-energy and low-intensity neutral atomic fluxes in the solar system is proposed. The technique has never been used earlier in space research and is based on i) conversion of the neutral atoms and molecules to negative ions, and ii) subsequent analysis and detection of the negative ions by means of magnetic and time-of-flight analyzers in an essentially noise-free, multicoincidence mode. We will discuss advantages and limitations of the technique as well as possible ways to implement this novel ultra-sensitive approach. The technique could be used for *in situ* i) measurement of the composition (H, D, and O atoms) of the LISM interstellar gas, ii) detection of neutral hydrogen atoms in the sun's vicinity, iii) study of the tenuous atmospheres of the planets, their moons, and small bodies in the solar system as well as the oxygen atom distribution around Earth. It is anticipated that the proposed approach may ultimately result in development of a new generation of highly efficient space instruments to be flown on deep space and planetary missions and to provide continuous monitoring of the conditions at low Earth orbit.