

EXPLORATORY ANALYSIS OF CARBON DIOXIDE LEVELS, ULTRASOUND AND OPTICAL COHERENCE TOMOGRAPHY MEASURES OF THE EYE DURING ISS MISSIONS

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Enhanced screening for the Visual Impairment/Intracranial Pressure (VIIP) syndrome has been implemented to better characterize the ocular and vision changes observed in some long-duration crewmembers. This includes implementation of in-flight ultrasound in 2010 and optical coherence tomography (OCT) in 2013. Potential risk factors for VIIP include cardiovascular health, diet, anatomical and genetic factors, and environmental conditions. Carbon dioxide (CO₂), a potent vasodilator, is chronically elevated on the International Space Station (ISS) relative to ambient levels on Earth, and is a plausible risk factor for VIIP. In an effort to understand the possible associations between CO₂ and VIIP, this study explores the relationship of ambient CO₂ levels on ISS compared to inflight ultrasound and OCT measures of the eye obtained from ISS crewmembers. CO₂ measurements were aggregated from Operational Data Reduction Complex and Node 3 major constituent analyzers (MCAs) on ISS or from sensors located in the European Columbus module, as available. CO₂ levels in the periods between each ultrasound and OCT session are summarized using timeseries metrics, including time-weighted means and variances. Partial least squares regression analyses are used to quantify the complex relationship between specific ultrasound and OCT measures and the CO₂ metrics simultaneously. These analyses will enhance our understanding of the possible associations between CO₂ levels and structural changes to the eye which will in turn inform future analysis of inflight VIIP data.