Geometric Magnetic Frustration in Li$_3$Mg$_2$OsO$_6$ Studied with Muon Spin Relaxation$^1$ J. P. CARLO, Villanova University, S. DERAKHSHAN, California State University - Long Beach, J. E. GREEDAN, McMaster University — Geometric frustration manifests when the spatial arrangement of ions inhibits magnetic order. Typically associated with antiferromagnetically (AF)-correlated moments on triangular or tetrahedral lattices, frustration occurs in a variety of structures and systems, resulting in rich phase diagrams and exotic ground states. As a window to exotic physics revealed by the cancellation of normally dominant interactions, the research community has taken great interest in frustrated systems. One family of recent interest are the rock-salt ordered oxides A$_5$BO$_6$, in which the B sites are occupied by magnetic ions comprising a network of interlocked tetrahedra, and nonmagnetic ions on the A sites control the B oxidation state through charge neutrality. Here we will discuss studies of Li$_3$Mg$_2$OsO$_6$ using muon spin relaxation ($\mu$SR), a highly sensitive local probe of magnetism. Previous studies of this family included Li$_5$OsO$_6$, which exhibits AF order below 50K with minimal evidence for frustration, and Li$_3$MgReO$_6$, which exhibits glassy magnetism. Li$_3$Mg$_2$RuO$_6$, meanwhile, exhibits long-range AF, with the ordering temperature suppressed by frustration. But its isoelectronic twin, Li$_3$Mg$_2$OsO$_6$ (5$d^3$ vs. 4$d^3$) exhibits very different behavior, revealed by $\mu$SR to be a glassy ground state below 12K. Understanding why such similar systems exhibit diverse ground-state behavior is key to understanding the nature of geometric magnetic frustration.

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