Interplay between structural and electronic behavior in iron bearing silicate perovskites at conditions of Earth lower mantle: Inside from combined X-ray diffraction, Mossbauer and Raman spectroscopy, NFS, and XANES studies.

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A major goal in the geosciences is to understand (and predict) how the Earth works, which requires a detailed knowledge of how the mineral phases which make up the Earth behave under high pressure and high temperature conditions. Much attention has been focused on the silicate perovskite phase, since it makes up nearly half of the Earth's interior, and special attention has been focused on phase transitions due to their significant implications for mantle behaviour. The majority of measurements have been made on *pure* $MgSiO_3$ perovskite, however, and almost exclusively using X-ray powder diffraction. Although the importance of Fe and Al as minor components of the silicate perovskite phase has been well documented in the past decade in numerous papers including many published in Science and Nature, the few studies using methods sensitive to these elements (e.g., X-ray emission spectroscopy and nuclear forward scattering) were not sufficiently systematic and/or sensitive to recognise any significant changes in the pressure range below 100 GPa. We studied silicate perovskites (Mg0.88Fe0.12)SiO3 and (Mg0.9Fe0.1)(Si0.975Al0.025)O3 by means of high resolution X-ray powder diffraction, Mossbauer and Raman spectroscopy, nuclear forward scattering and XAS at pressure up to 120 GPa and temperature above 2500 K. We will discuss effects of changes in iron electronic state on structure of perovskites.