SEEJ: Structure & Evolution of ExoJupiter Atmospheres

Characterizing the Atmospheres of Exoplanets

Scott Wolk, Jae-Sub Hong, Suzanne Romaine, Vinay Kashyap, Brad Wargelin, Katja Poppenhaeger, Christopher S. Moore, Edward Hertz
Jeremy Drake, Ignazio Pillitteri, Lisa Kaltenegger, Jennifer Winters, Ralph Kraft, Diab Jerius, Almus Kenter, Dennis Gallagher, Althea Moorhead

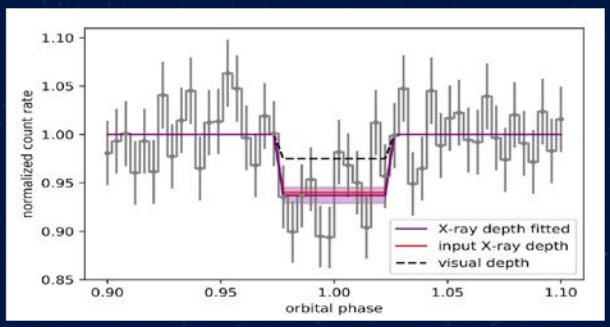
SEEJ will study the Structure and Evolution of ExoJupiter/Neptune atmospheres with long observations, with cumulative exposures well beyond those conducted by any other mission. By observing transits, SEEJ will measure the thermospheric scale height, and so the inflation or erosion of the exo-planet atmosphere. SEEJ will provide the data for theory to tie the high energy flux and flare effects together via improved models of exoplanet thermospheres.

The objectives of SEEJ are:

1) To quantify the activity of the stellar hosts through sustained monitoring and …

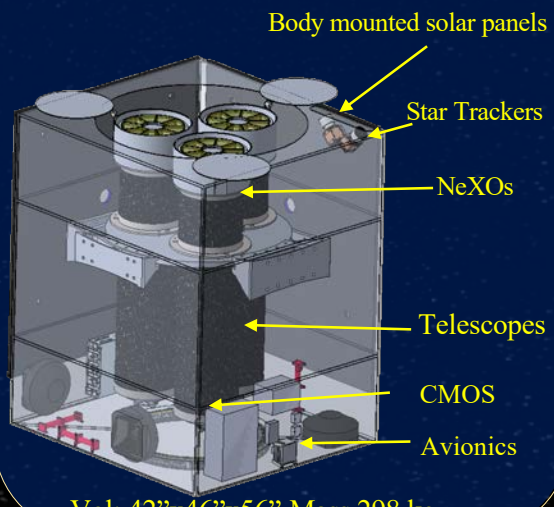
2) To measure the extent of exoplanets' atmospheres via measurement of the depth, width and shape of the exoplanet transit X-ray light curve.

Transit X-ray Light Curve



Simulated co-added SEEJ X-ray light curve of 40 transits of a HD 189733b-like planet in front of its host star (red), together with the simplest fitting model choice, an inverse top hat fit to the data (purple). The input model has a 6% X-ray transit depth.

Spacecraft Design



Vol: 42"x46"x56" Mass 298 kg

Mirrors and Effective Area

SEEJ, like XMM-Newton & IXPE, will combine multiple optics modules to achieve significant collecting area. Each Nested X-ray Optics (NeXO) module is composed of compact lightweight Wolter-I X-ray optics suitable for CubeSat/SmallSat missions. NeXO leverages the on-going development of electroformed Ni-alloy replication techniques to make Wolter-I X-ray optics with large area-to-mass ratios.