

Astro Seminar Series



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The habitable zone as seen through the atmosphere

The dominant paradigm in assigning "habitability" to terrestrial planets is to define a circumstellar habitable zone: the locus of orbital radii in which the planet is neither too hot nor too cold for life as we know it. I'll review the atmospheric physics that has led to hard boundaries being set for the habitable zone and show recent work which shows multiple stable states and challenges these boundaries.

The width of the habitable zone is turns out to be determined by the atmospheric inventories of di-nitrogen and carbon dioxide. Yet Earth teaches us that these abundances are very heavily influenced (perhaps even controlled) by biology. This is paradoxical: the habitable zone seeks to define the region a planet should be capable of harbouring life; yet whether the planet is inhabited determines these boundaries. This matters, because future life detection missions may use habitable zone boundaries in mission design.

I propose that we must amend the paradigm of habitability to acknowledge that habitability depends on inhabitation; for life as we know it is a planetary scale—and planet dominating—phenomenon.

Tuesday Nov 10, 3:30pm
Bell Room (103)
Rutherford Physics Building