with little time delay, inconsistent with purely radiative equilibrium conditions. Stratospheric temperature (or C_2H_6 abundance) peaked sharply poleward of 81°S latitude in a high-resolution Keck image in 1998. Meridional variations of stratospheric and tropospheric temperature are not strongly correlated with one another. Planetary-scale zonal waves as large as 1 Kelvin amplitude are seen in the stratospheric temperature field, with some evidence for even larger-amplitude waves in the troposphere. Similar to vortices in Titan and Jupiter, we might expect Cassini to detect a polar vortex (*e.g.* a region of depressed temperatures with a sinusoidal boundary), if driven by the seasonal loss of insolation poleward of its arctic circle. This work was supported by funds from NASA to the Jet Propulsion Laboratory, California Institute of Technology and the Goddard Space Flight Center. Brett Beach-Kimball was supported by the Undergraduate Student Researcher Program (USRP); Brian Jackson was supported by JPL as a Caltech Summer Undergraduate Research Fellow.

P51C-0466 0830h POSTER

Representing Planetary Atmospheric Structures and Observables with Radio Occultation Transform Pairs

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Current methods for relating radio occultation observables (the bending angles) to the refractivity profile of a planetary atmosphere require significant numerical integration. Although accurate and valid, this approach does not clearly illustrate how changes in refractivity, based on physical parameters such as temperature, pressure, or number density, relate to changes in the observed bending angles, and vice versa. However, the radio occultation Abel transform does have one known transform pair directly relating refractivity to bending angle, as derived by Eshleman (1973). The radio occultation transform pair has the potential to allow direct understanding of how changes in atmospheric refractivity and the observed bending angles map to each other. The complete analytical form of the radio occultation transform pair is complicated, in part because the radio occultation Abel transform includes ray bending effects. However, it can be written out in terms of a series expansion. Assuming certain common atmospheric conditions, such as a thin atmosphere, allows significant simplification by keeping only a few terms of the series and does not affect the validity of the representation (Eshleman, 1996). These simplifications allow representation of atmospheric refractivity structures in terms of power law expressions with controllable constants that map directly to the observed bending angles. We evaluate the superposition of several power law refractivity terms to represent atmospheric structures for both thin and thick atmospheres, the errors introduced in the refractivity profiles at different levels of simplification, and make initial observations of how physical differences in a planetary atmosphere, expressed in terms of refractivity, map to changes in the observed bending angle. The radio occultation transform pair approach allows us to better understand how differences in the refractivity structure of a planetary atmosphere relate to changes in radio occultation observables, without numerical integration.

P51D MCC: Level 1 Friday 0830h

The Young Solar System I Posters *(joint with NG)*

Presiding: **Y Nakagawa,** Kobe University

P51D-0467 0830h POSTER

General Circulation of the Transiting Exoplanet, HD209458b

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Showman and Guillot 2002 (A&A, 385, 166S) presented preliminary numerical simulations of the meteorology of HD209458b's atmosphere in the radiative region using the EPIC model of Dowling et al. 1998 (Icarus 132, 221). Their simulations reveal that the intense radiation of the star sustains a steady temperature difference between the day and night sides of the planet. In steady state, the models predict strong eastward equatorial jets. The magnitude of the day-night temperature difference depends on the radiative transfer of the upper atmosphere, the physics of the deep atmosphere at the interface with the planet's fully convective interior, and the effects of winds. We will present improved, higher resolution three-dimensional models of the general circulation of HD209458b. Day-night temperature variations and winds are potentially observable both in the infrared light curve of the planet, if it can be measured, and in the planetary albedo, which is likely to be variable across the planet's surface due to variations in upper atmospheric chemistry and cloud formation.

P51D-0468 0830h POSTER

A Planetesimal Accretion Zone in a Circumbinary Disk.

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Until recently, it had been believed that only single solar-type stars might harbor planetary systems. On the other hand, circumbinary disks have been detected by mm/sub-mm wavelength observation. Planets may be formed also in such disks. We investigate the conditions for planetesimal accretion in a circumbinary disk. The binary system gives stronger gravitational perturbation against planetesimals orbiting nearer to the binary. Therefore, the relative velocities between planetesimals will be larger, and when they exceed the escape velocity, it is impossible for the planetesimals to accumulate into a planet. We perform long-term numerical integrations of binary and planetesimal orbital motions, and find the upper limit of planetesimal semimajor axes where the velocity dispersion of the planetesimals exceeds the escape velocity. That is, when the binary semimajor axis is set to 1 AU, the eccentricity to 0.1 and the total mass to 1 $M_{\odot}$, the planetesimals are prevented from accreting when they orbit in a zone within 13 AU from the barycenter of the binary system. In regions outer than 13 AU, planetesimals can accrete. We also derive an analytic expression of the eccentricity of a planetesimal excited by the gravitational perturbation of the binary.

P51D-0469 0830h POSTER

No Evidence for Trapped Noble Gases in CAIs

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Refractory inclusions (CAIs) in meteorites probably are the first solids in the solar system. Although formed at high temperatures, CAIs are reported to contain trapped noble gases [1,2,3] which would provide information on CAI formation and solar system evolution. We reassessed this question by measuring Ne and Ar in CAIs of primitive chondrites (Allende, Axtell, Efremovka) by IR-laser extraction suitable for measuring low gas concentrations [4]. We chose meteorites with different preatmospheric radii, exposure ages, and degrees of alteration to take into account those effects on CAI noble gas compositions.
$^{20}Ne/^{22}Ne$ is below 0.9 indicating the absence of common trapped Ne. We suggest that elevated $^{20}Ne/^{22}Ne$ of [1,2,5] resulted from contamination of their CAI samples with matrix rich in trapped Ne. $^{21}Ne/^{22}Ne$ is 0.72 to 0.86; more altered CAIs show the lower ratios. The Ne might be a mixture of chondritic cosmogenic Ne and nearly pure ^{22}Ne, e.g., from presolar SiC [3]. However, calculated cosmogenic Ne for CAI minerals perfectly mimics the observed trend; in particular Na-rich alteration phases shift the $^{21}Ne/^{22}Ne$ to lower values.
$^{36}Ar/^{38}Ar$ is 0.7 to 4.8, thereby more altered CAIs have higher ratios. The Ar might be a mixture of chondritic cosmogenic Ar (mainly produced from Ca) and trapped Ar [3] or solar wind Ar [2], the latter supporting CAI formation in an X-wind scenario [6]. However, due to high Cl concentrations in CAIs also nearly monoisotopic ^{36}Ar produced cosmogenically by neutron capture and beta- decay on Cl must be taken into account. Modelling Ar ratios and concentrations using only cosmogenic Ar from Ca and Cl nicely match the measured data. Thereby more Cl-rich altered CAIs show higher $^{36}Ar/^{38}Ar$.
Although the data do not principally contradict the presence of trapped Ne or Ar in CAIs they can be straightforwardly explained by cosmogenic productions mainly from Na, Ca, and Cl.
[1] Smith et al. (1977) GCA, 41, 627-647; [2] Shukolyukov et al. (2001) Geochem. Int., 39(1), 110-125; [3] Russel et al. (1998) MAPS, 33, A132; [4] Vogel (2003) PhD-Thesis, ETH Zuerich, Switzerland; [5] Goebel et al. (1982) GCA, 46, 1777-1792; [6] Shu et al. (1997) Science, 277, 1475-1479.

P51D-0470 0830h POSTER

Consideration of formation process for the nuclei on precursor

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The very isotropic microwave background and the Hubble expansion indicate that the universe has evolved from an earlier state of high temperature and density that can be reasonably well described by Friedman-Lemaitre-Robertson-Walker cosmological models. The nuclear evolution of non-degenerate matter expanding from very high temperature was studied in detail for various values of the expansion rate and of the proton-neutron abundance difference and baryon density[1,2,3]. In this calculation, many nuclear reactions were included, and its results suggested important reaction process for the evolution of nuclear abundances. 3He and 4He are very important elements in these nuclear reactions as the primordial nucleosynthesis. Microscopic study for few body system is one main topic in nuclear theoretical physics. In this field, very accurate calculations are available by using the Faddeev equations[4]. Recently, many data for pd, p-3He and d-3He have been obtained including polarized observables. Model calculations for systems including 3He and 4He (for example, d + 3He → p + 4He) are carried out using the Faddeev equations based on the meson exchange models[4]. This model reproduces well the empirical phase shifts which are determined by so-called phase-shift analyses using all of available scattering data measured at various laboratories around the world[5,6,7]. Constructions of models for the nuclear reactions including 3He and 4He will give important information for calculations of the primordial nucleosynthesis after big-ban. The calculations are carried out until the sum of the abundances at each mass number ceases to change. Various different set of initial conditions for the baryon mass density, the expansion rate and the neutron-proton ratio are used. Dusts kept in precursor asteroid nebular form precursor asteroid, then, formations of planet start [8]. Possible values of parameters in the initial conditions for theoretical calculations will be searched considering an information from precursor asteroid References:
[1] R. V. Wagoner, W. A. Fowler and F. Hoyle (1967), Astrophys. J. 148, 3. [2] R. V. Wagoner. (1969), Astrophys. J. 162, 247. [3] R. V. Wagoner (1973), Astrophys. J. 179, 343. [4] For example, S. Gojyuki and S. Oryu (2003), Mod. Phys. Lett. A18, 302. [5] Y. Yoshino, V. Limkaisang, J. Nagata, H. Yoshino and M. Matsuda (2000), Prog. Theor. Phys. 103, 107. [6] H. Yoshino, J. Nagata, V. Limkaisang, Y. Yoshino, M. Matsuda (2001), Nucl. Phys. A684, 615c. [7] H. Yoshino, H. Kazuo, M. Matsuda, J. Nagata, (2003), Mod. Phys. Lett. A18, 444. [8] Hayashi, C. et. al., 1985, Protostars and Planets, Univ. of Arizona Press, pp. 1100.

P51E MCC: 2002-2004 Friday 0915h

The Asteroid Impact Hazard: Moving Beyond Spaceguard *(joint with PA)*

Presiding: **A W Harris,** Space Science Institute, University of Colorado**; D Morrison,** NASA Astrobiology Institute

P51E-01 0920h INVITED

An Updated Assessment of the Hazard Due to Earth Impacts

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