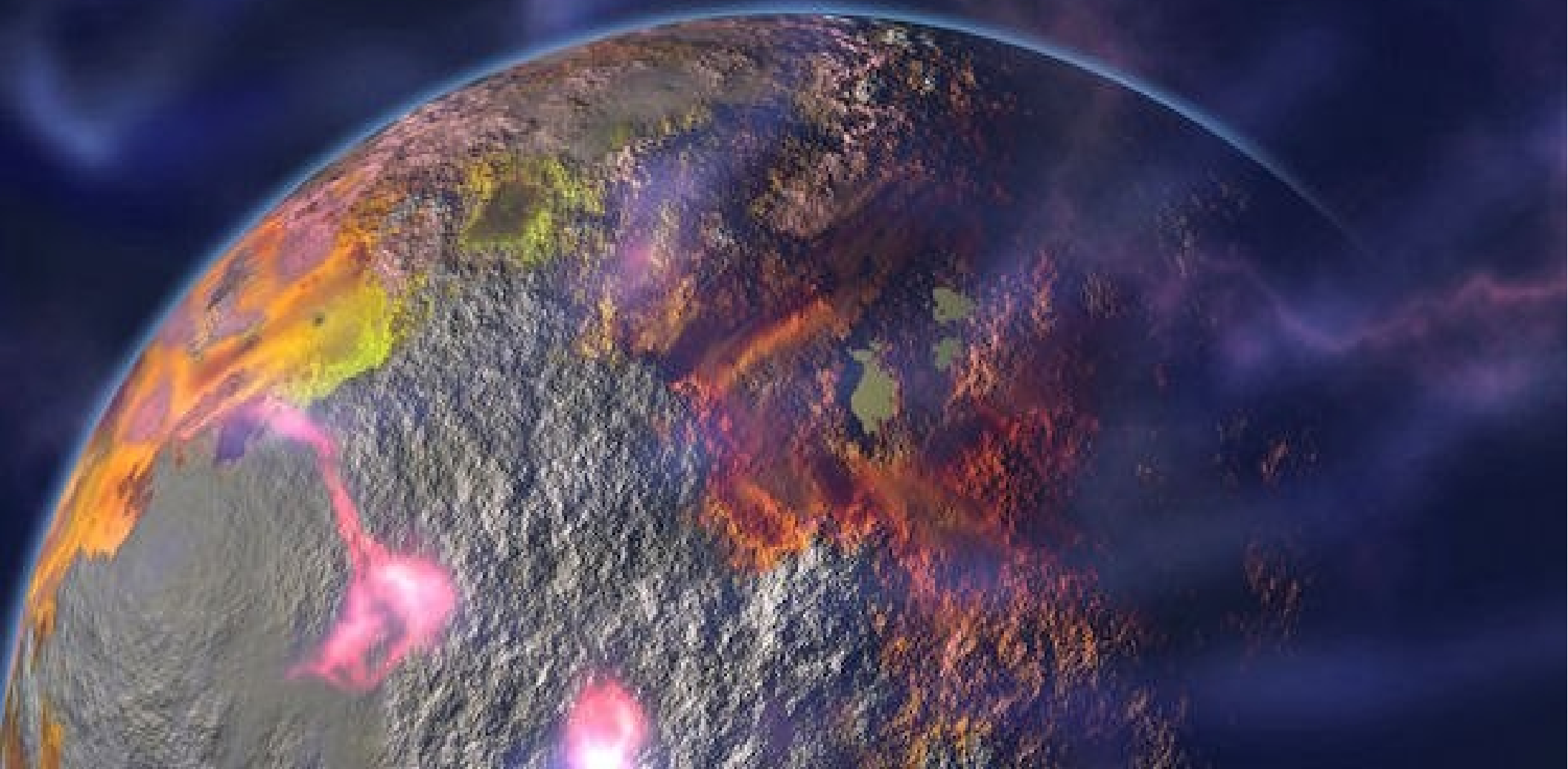


Understanding the Atmospheres of Hot Earths and  
the Impact on Solar System Formation

# Year 1 milestones



Things we said would be accomplished in our proposal.

Listed straight from the proposal for the investigators to discuss.

Year 1 ends January 14, 2014

## Theory: Bruce

\* Incorporate water, hydride, and hydroxide gases into MAGMA

## Theory: Bruce

\* Use modified MAGMA with CONDOR and IVTAN to model Corot-7b, Kepler-10b, and 55 Cnc e for BSE compositions containing 0 - 20% (by mass) water as indicated by literature models.

## Theory: Bruce

- \* Predict partial pressures and column densities of key gases which could be observed to distinguish anhydrous and water-bearing models for those 3 planets.

Lab work: Dave and Nate

- \* Construct a new high-temperature Knudsen cell for use in conjunction with existing planetary-ice experimental system at MSU.

Lab work: Dave and Nate

\* Purchase equipment including silicon or silicon-bolometer detectors.  
(MSU)

## Lab work: Dave and Nate

- \* Mount samples onto a high-T, ultra-high vacuum sample heater

- \* and measure the masses of evolved species using a standard quadrupole mass spectrometer.

- \* Work out the experimental details for the vapor-phase spectra.



## Lab work: Dave and Nate

\* Use a Knudsen cell molecular beam method to determine the composition of the vapor in equilibrium with the solid mineral, using mass spectrometry as the analysis method.  
(NASA-Glenn)

Lab work: Dave and Nate

- \* MSU collaborators to visit NASA-Glenn to better methodology behind the Knudsen cell technique and to stimulate general collaboration.

## Observation: Mike

- \* Observe candidate star-planet systems- locally and nationally
- \* Examine and improve various differencing techniques to optimize signal from the planet compared to that of the host star.

**Good Start Here**

## Observation: Mike

- \* At KPNO with GT Cam2: observe planetary systems for hot-spots which would be indicative of magma oceans on tidally locked planets. **Failed application**

- \* Produce code to convolve lab-measured atmospheric spectra with model and observed spectra to ascertain visibility with stellar

## Observation: Mike

- \* Produce code to convolve lab-measured atmospheric spectra with model and observed spectra to ascertain visibility with stellar spectral type.

**Should be okay here.**

## Other:

- \* Outreach to Boyd Elementary School and Willard Intermediate School.

- \* 2 Grad Students and

- \* 3-4 Undergrads.

- \* Group collaboration meeting.

## Planned Travel:

- \* Dave and ? to DPS in Denver in October.

- \* Mike and Amanda to AAS in Washington, D.C. in January.

- \* Dave and team to NASA-Glenn in ? for collaboration.

Planned Travel:

\* Nate (and Bruce?) to MSU  
for consultation. When?



Anything else before  
PI-only work?

# Topics:

- \* Student recruitment
- \* Budget
- \* Collaboration status: are we collaborative enough?
- \* Grant progress.

# Year 1 Budget

Cost	MSU	WashU	NASA-Glenn	
PI Salary	10451 (Mike)	23039 (Bruce)	11760 (Nate)	
GAs	18274 (1.5)			
Travel	21000	1500	1500	
Tuition	13000			
UGrads	12000 (4 slots)			
Materials	9000		10000	
Publications	1000			
Machining	2100			
Center Costs			3722	
Equipment	54442			

# Year 2 Budget

Cost	MSU	WashU	NASA-Glenn	
PI Salary	10661 (Mike)	24228 (Bruce)	12307 (Nate)	
GAs	18274 (1.5)			
Travel	16500	1500	1500	
Tuition	13000			
UGrads	12000 (4 slots)			
Materials	9000		10000	
Publications	2000			
Machining	0			
Center Costs			3809	
Equipment	0			

# Year 1 Match Budget

	MSU	WashU	NASA-Glenn	
PI Salary	33760 (Mike & Dave)	20456 (Bruce)		
GAs	6091 (0.5)			
Travel	1500			
Indirect Waiver	36819			
Equipment	39000			