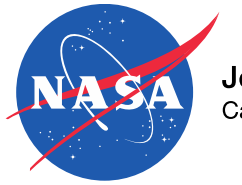

Jet Propulsion Laboratory
California Institute of Technology

The HyspIRI Preparatory Campaign VSWIR Level 1 and Level 2 Products

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With much assistance from Bo Cai Gao[2], Elyse Pennington[3], Dar. A. Roberts[4], Phil Dennison[5], Sarah Lundeen[1]

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[5] University of Utah
[6] NASA Ames Research Center

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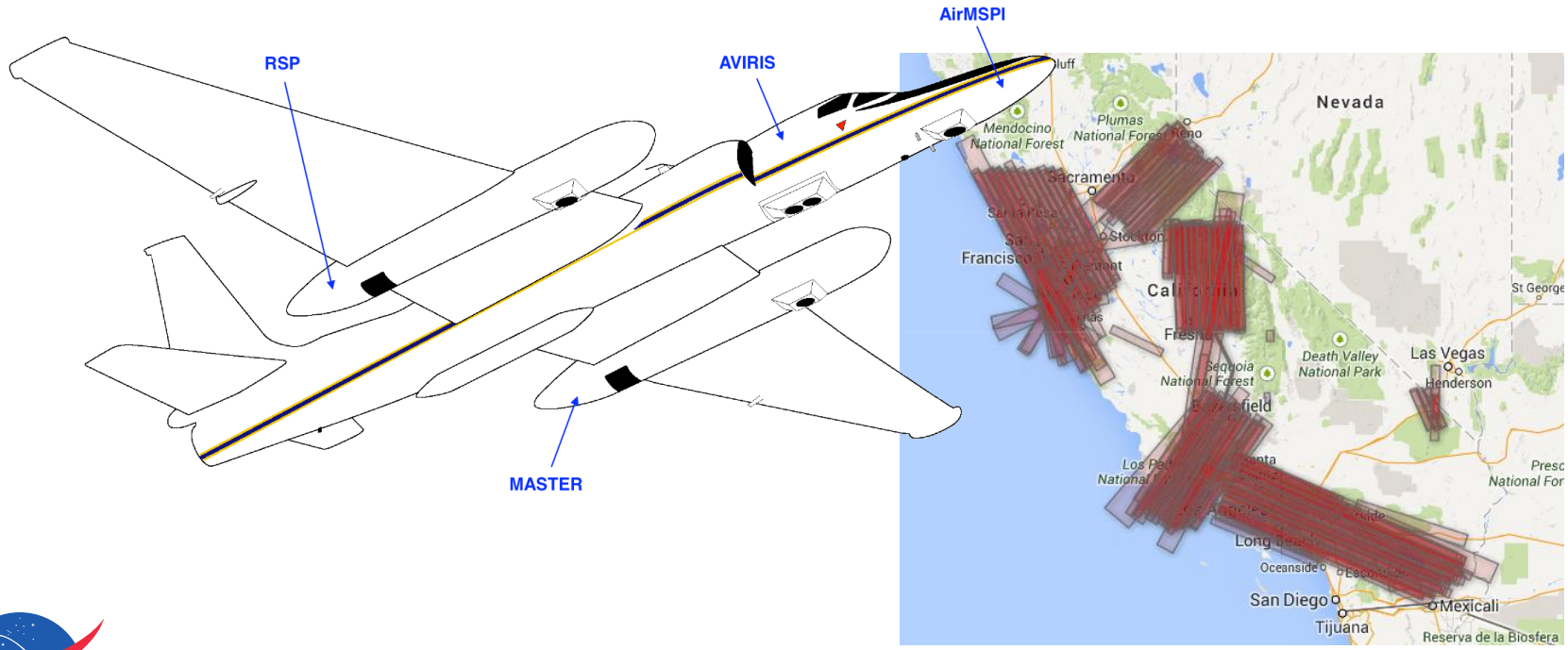
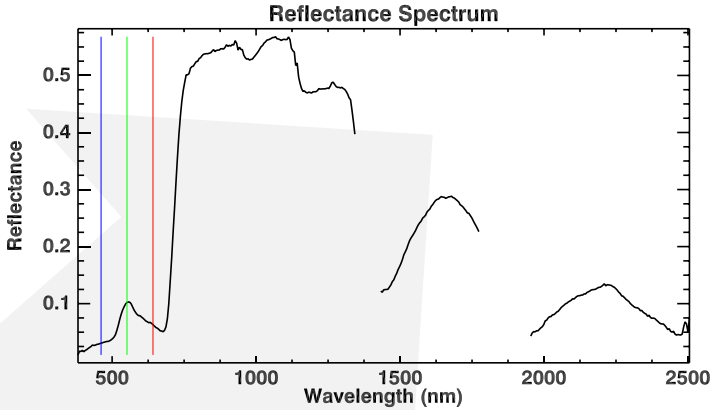
Agenda

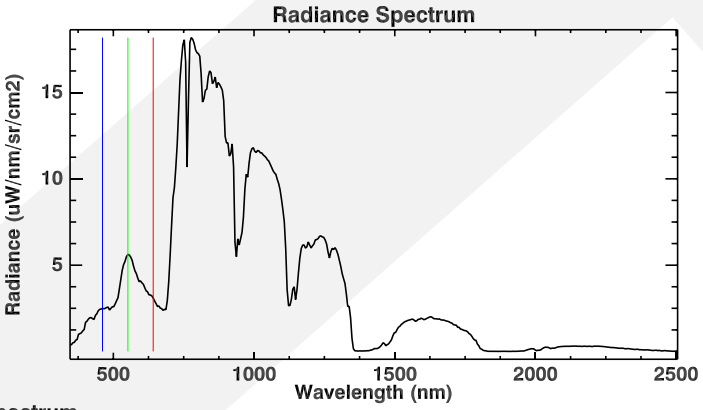
- **AVIRIS Product Definition and Algorithm Theoretical Basis**
- **Overview of the VSWIR HyspIRI simulated data**



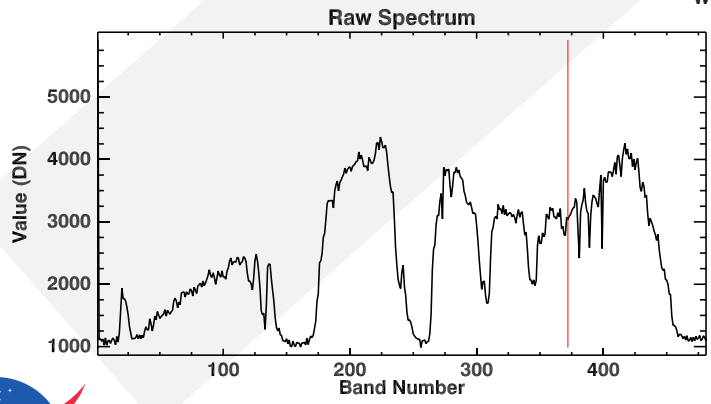
AVIRIS radiance / reflectance pipeline



Lambertian Reflectance (HDRF)



Radiance at sensor mW/nm/cm^2/sr

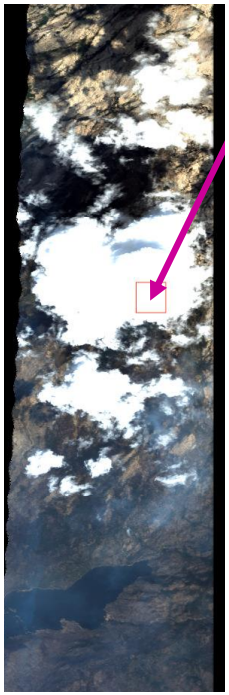


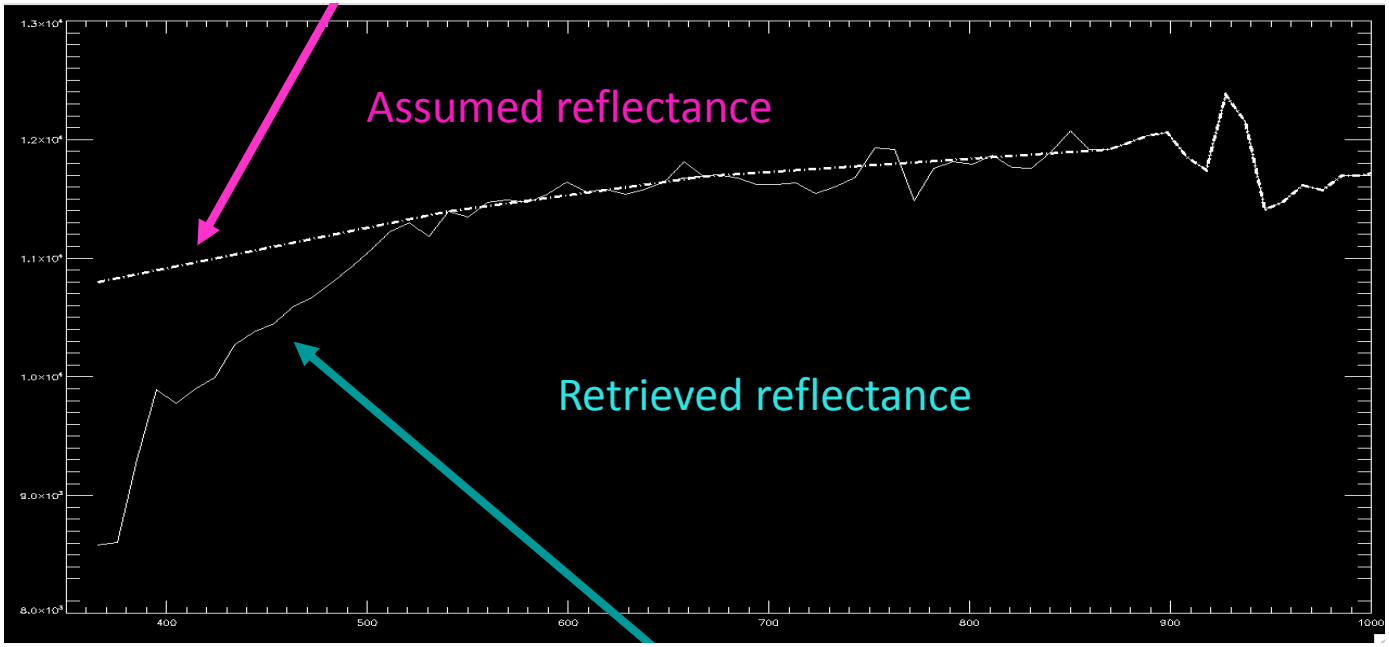
Raw Digital Numbers

[Gao et al., 1993; Green et al., 1998]

L1 Radiance calibration

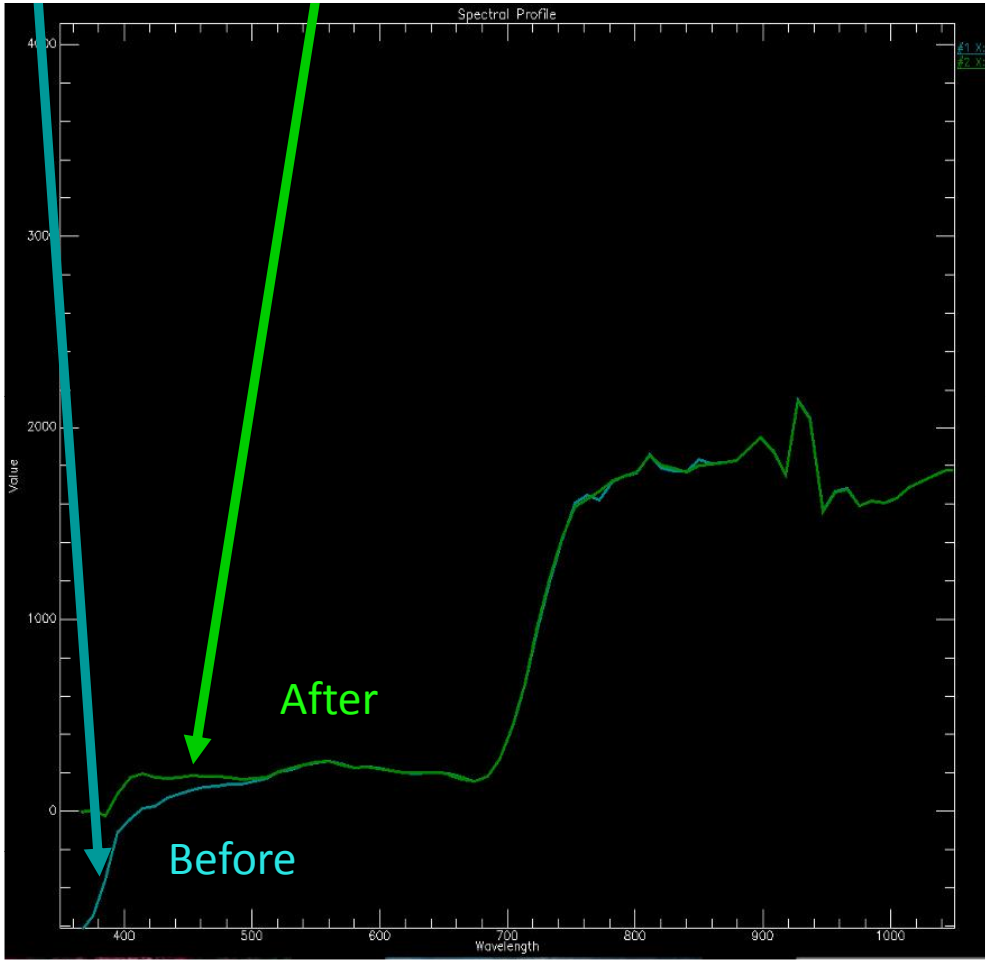
- Based on Laboratory calibration standards
- Minor radiometric correction in UV based on clouds (which are assumed smooth)





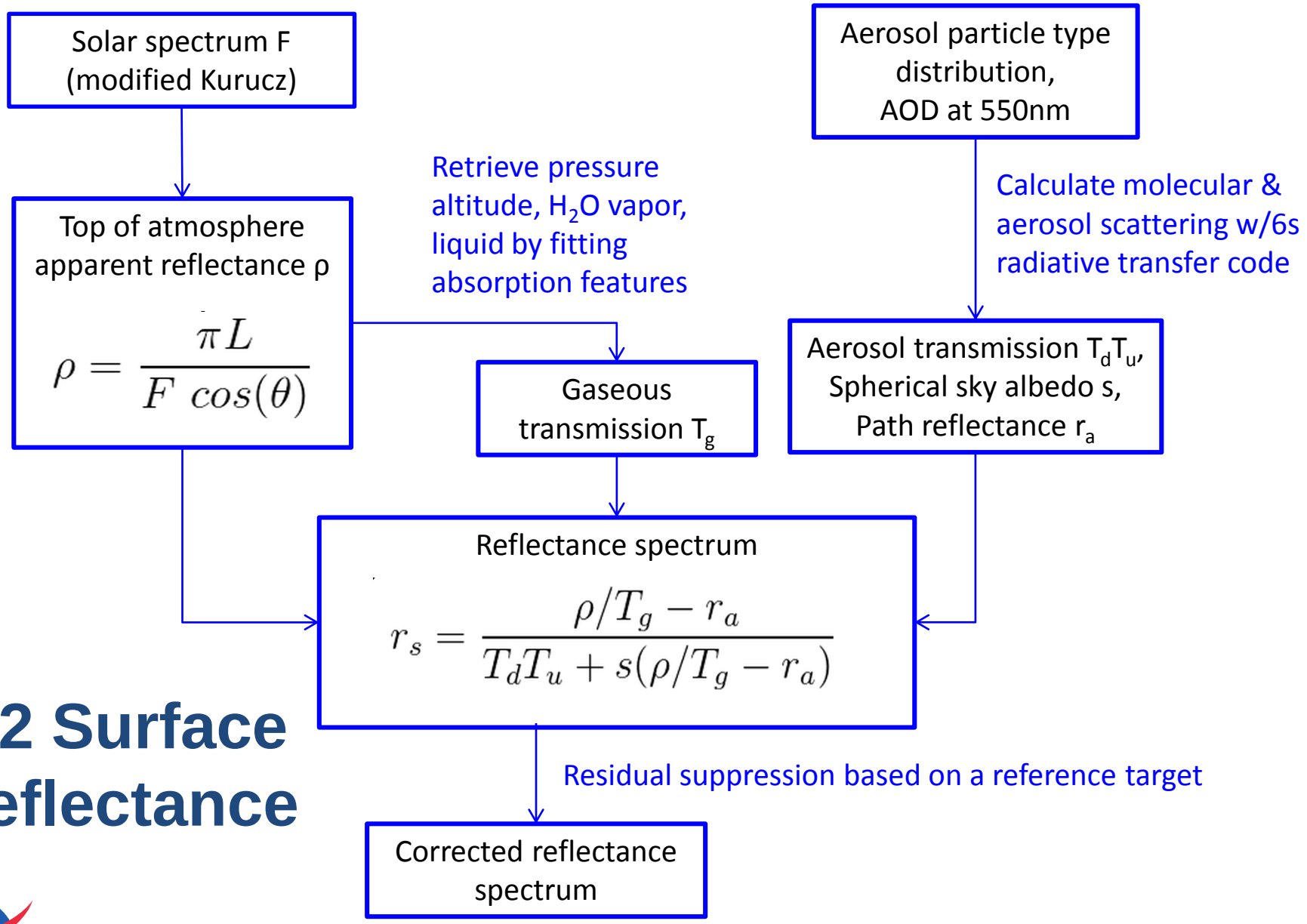
Courtesy Bo Cai Gao

Typical vegetation spectrum

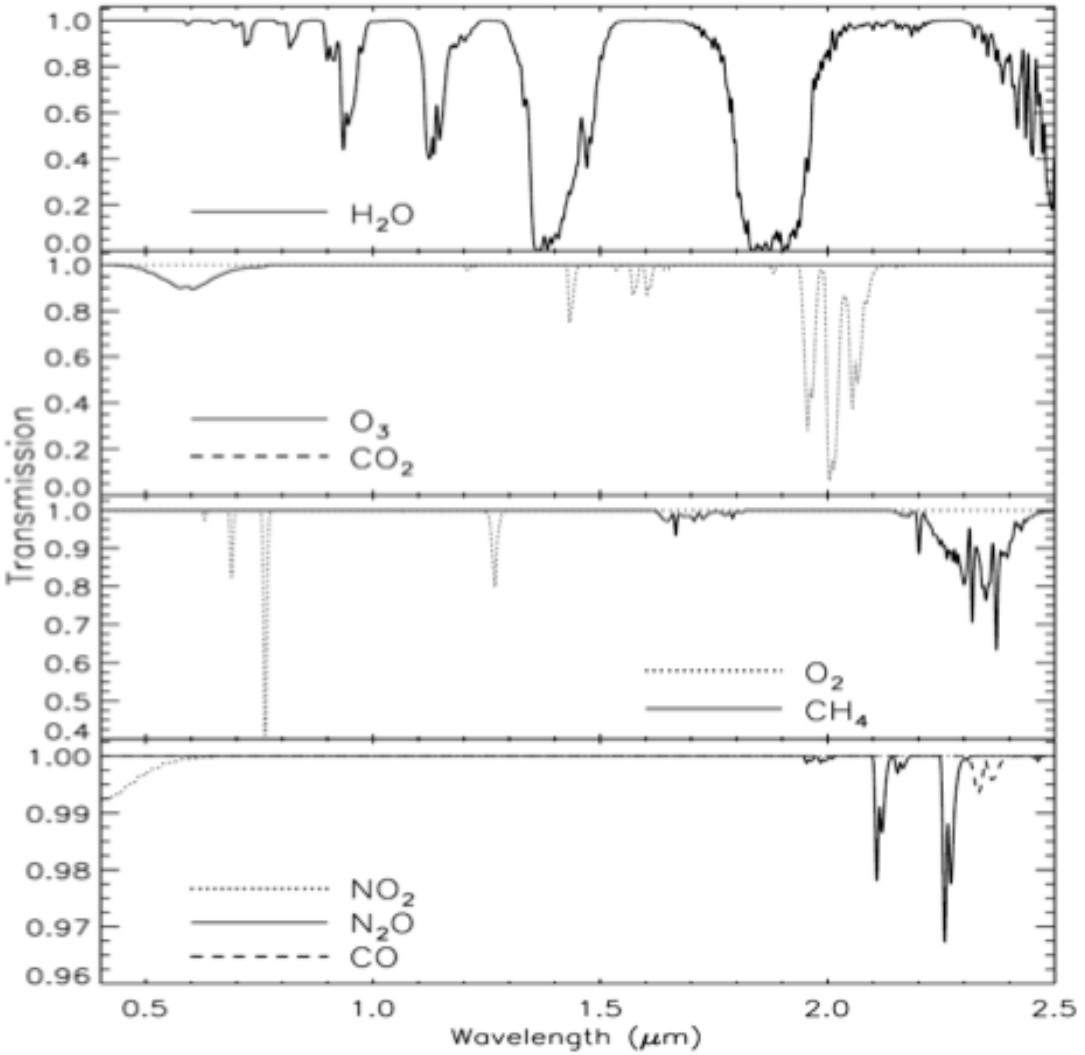


Courtesy Bo Cai Gao

L2 Surface reflectance



Typical transmittance



Absorption is modeled for 7 gases

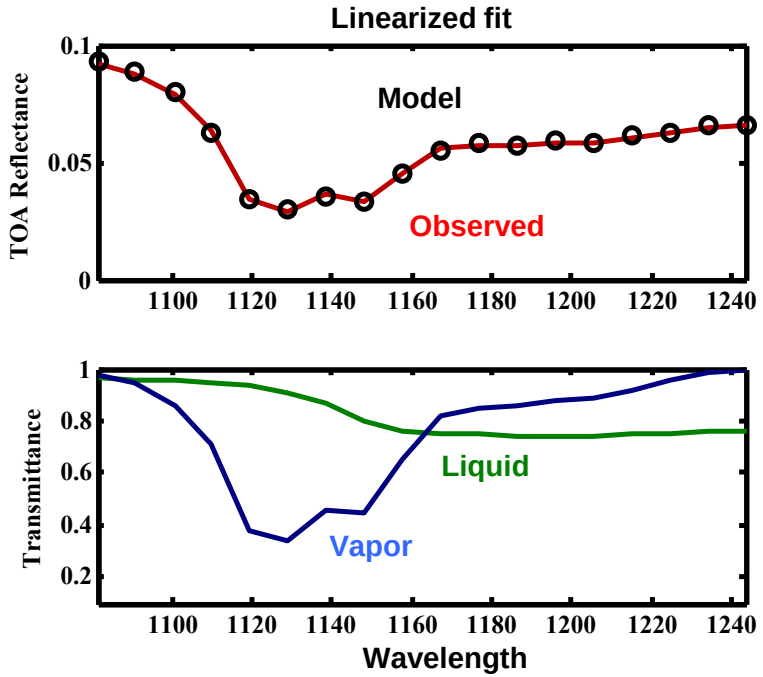
ATREM retrieves water vapor for each pixel using 0.94 and 1.14 µm H_2O band depths

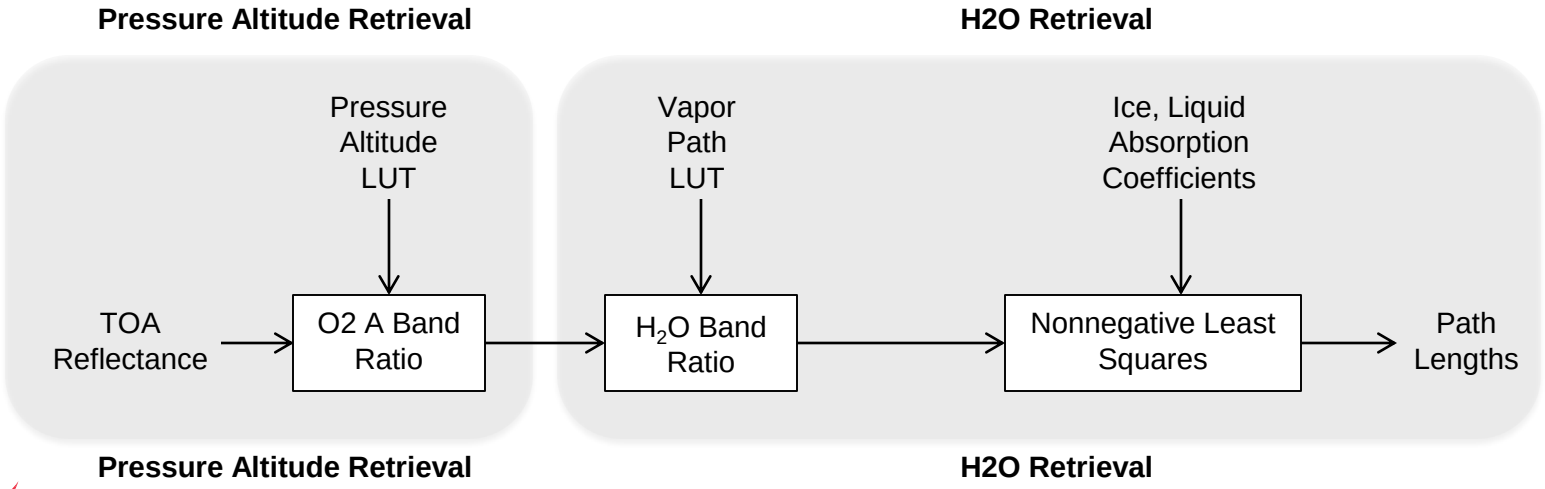
Vertical profiles use 20-layer atmospheres

[Gao and Green 2010]

Reducing bias in H_2O vapor maps

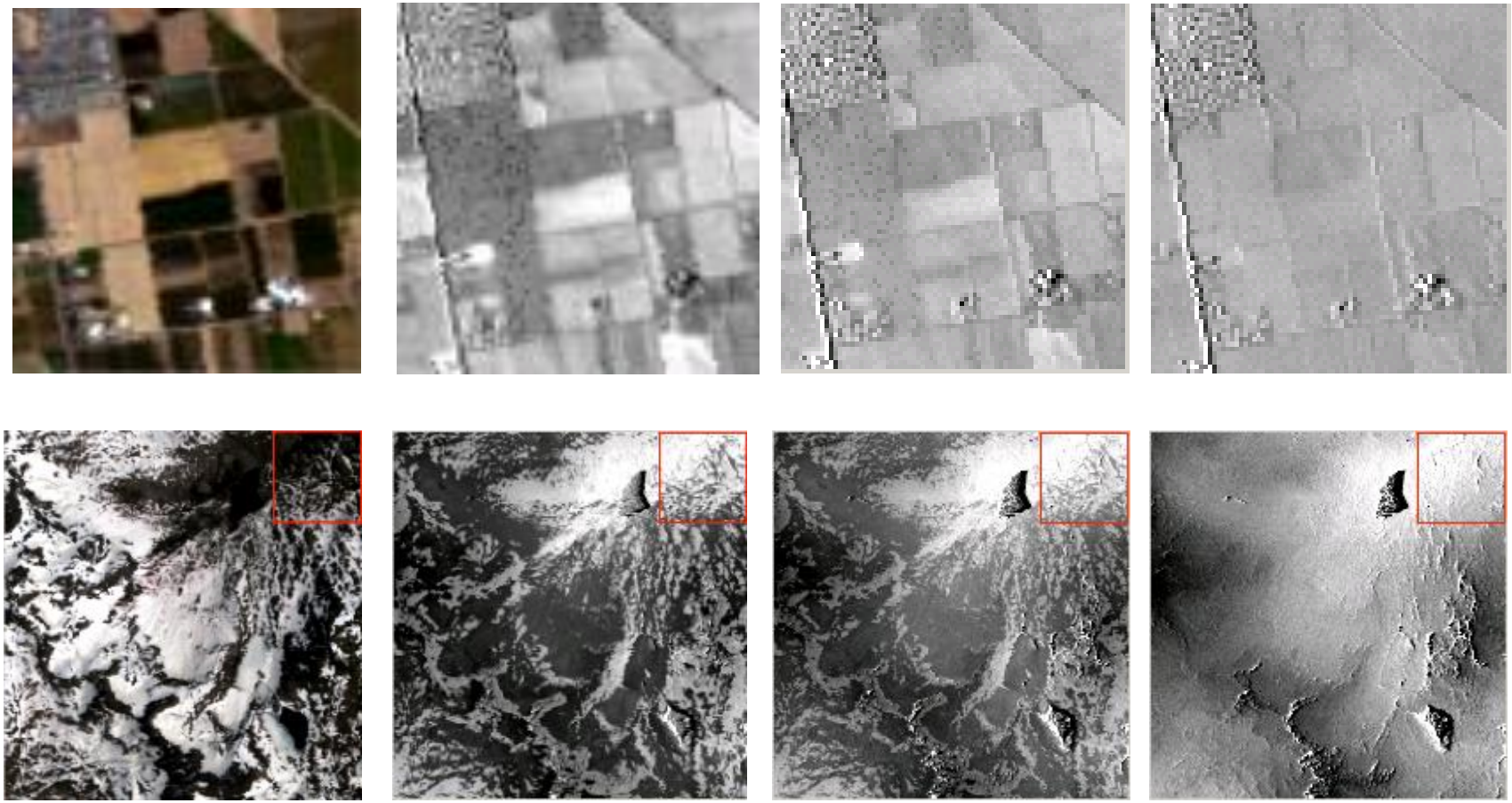
Thompson et al., HyspIRI Special Issue Rem. Sens. Environ 2015 (in press).





Better H_2O Vapor Maps

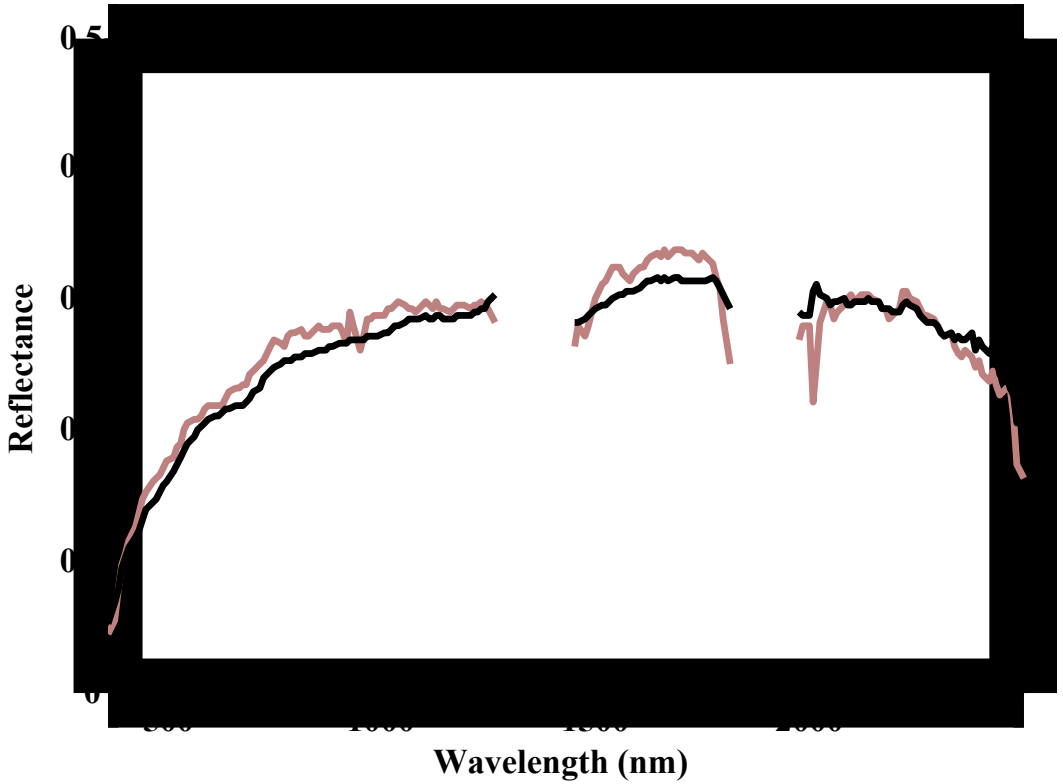
RGB | Initial guess | One fitting iteration | Converged



From Pennington et al., AGU 2015

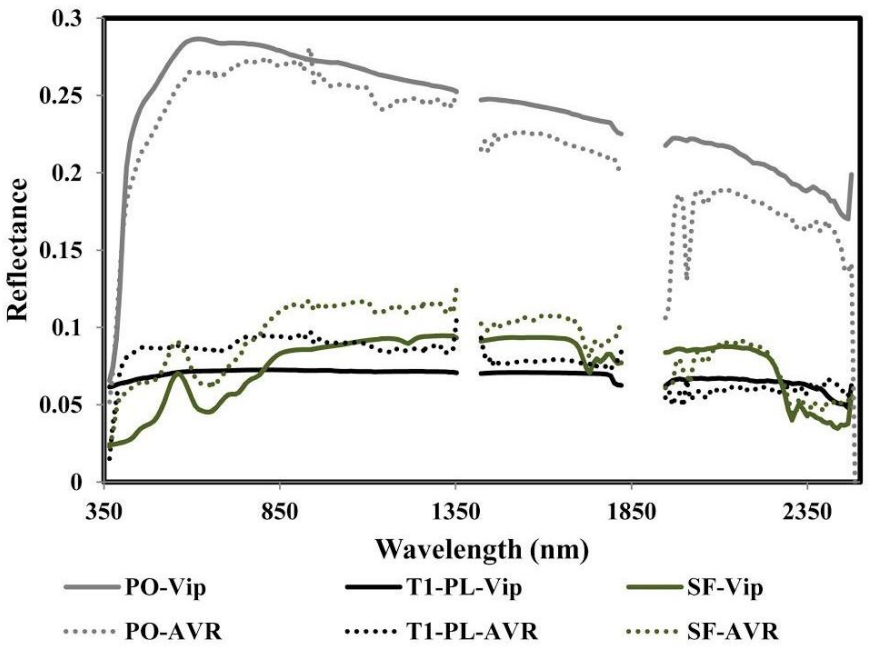
Residual suppression

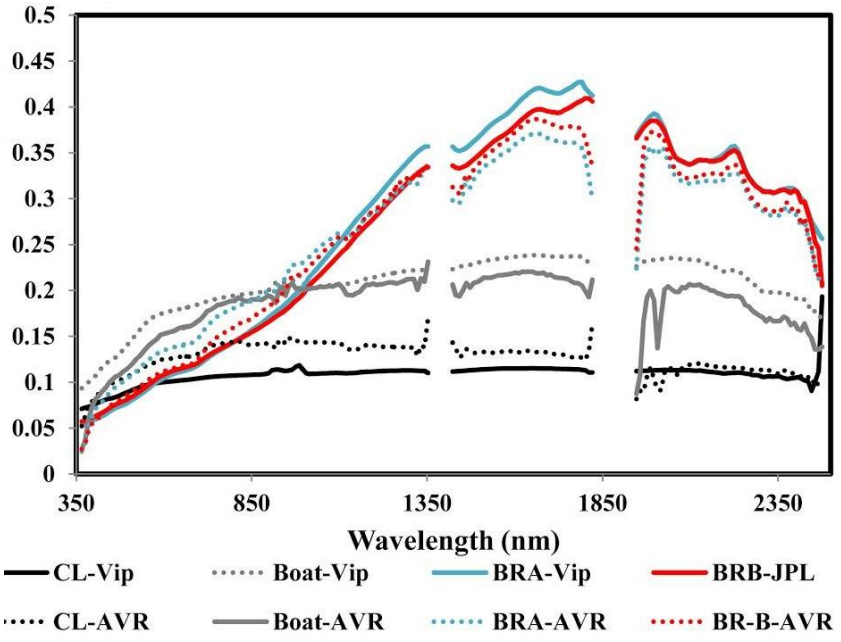
- Multiplicative correction
- Derived from a smooth surface once per flight season
- Reversible using coefficients stored in metadata



Ground truth validation targets

- Dark targets too bright, bright targets too dark
- This suggests uncorrected scattering is a major offender
- Accuracy degrades somewhat at short wavelengths
- Water vapor maps (not shown) still show some “vegetation bias”





Courtesy Dar Roberts from Thompson et al., RSE 2015 (in press)

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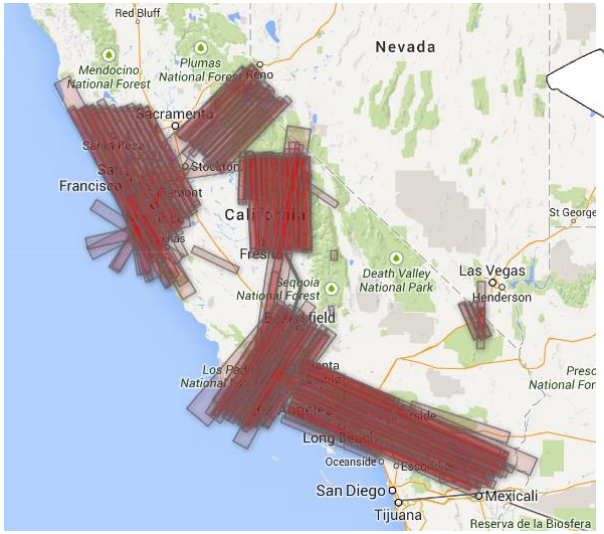
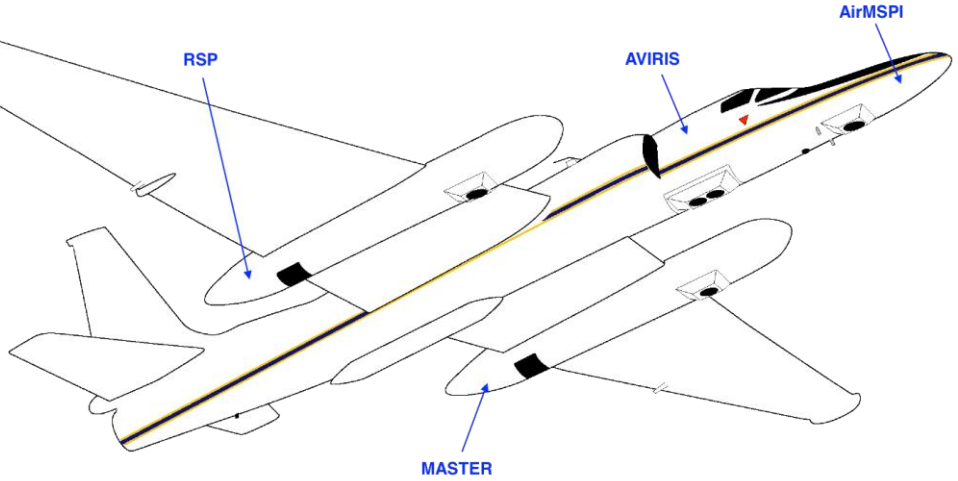
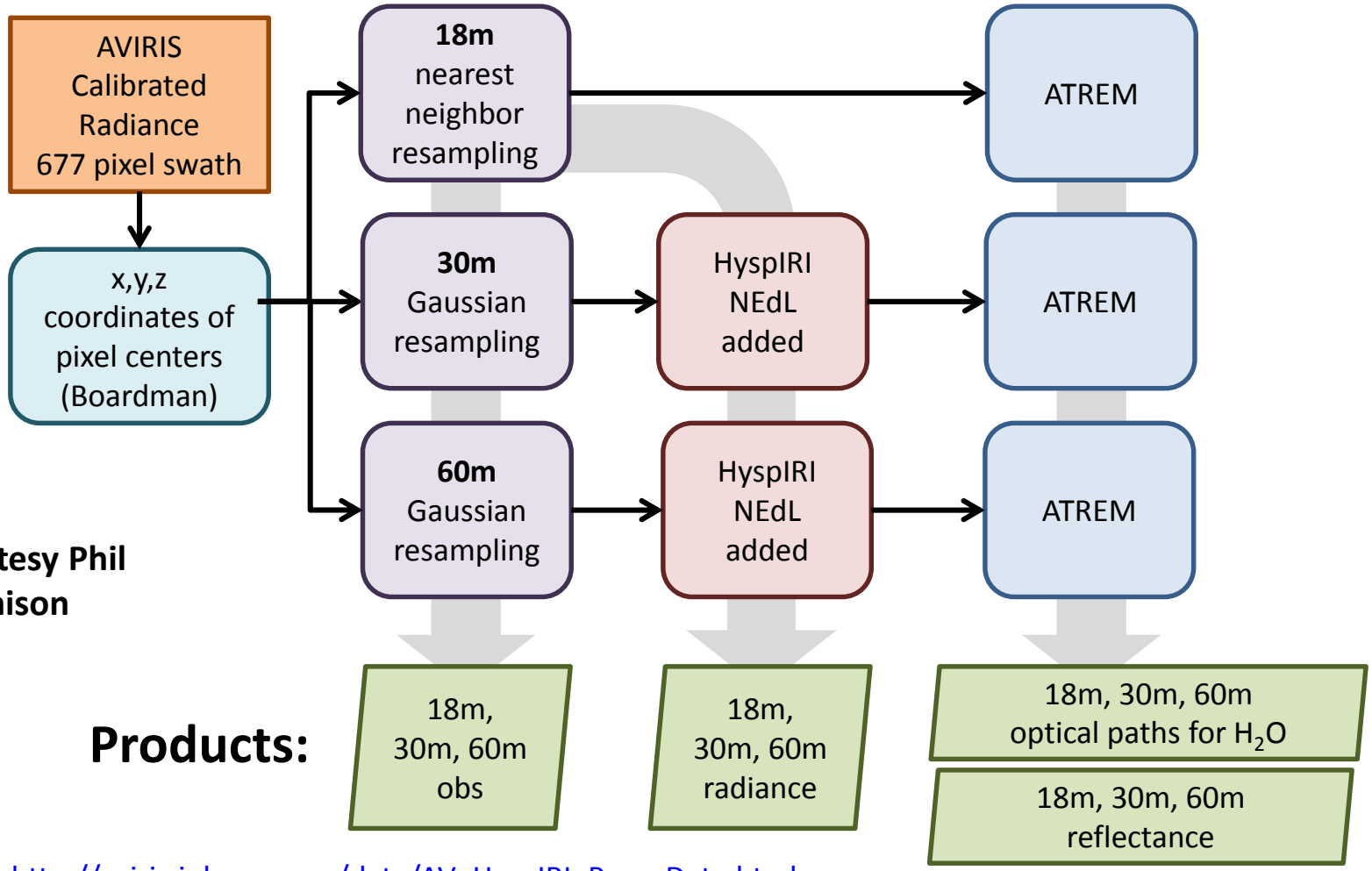




HyspIRI simulation objective

- Create orthorectified reflectance data with similar spatial and noise characteristics to the HyspIRI VSWIR
- Demonstrate processing pipeline that is scalable to anticipated HyspIRI data rates
- Demonstrate L2 algorithms operating across large, diverse geographic areas

HyspIRI simulated data products



http://aviris.jpl.nasa.gov/data/AV_HyspIRI_Prep_Data.html

Data access instructions:

http://aviris.jpl.nasa.gov/data/AV_HyspIRI_Prep_Data.html