DETECTING AND DISTINGUISHING METAMORPHIC GRADIENTS OF UNEQUILIBRATED (TYPE 3) ORDINARY CHONDRITES USING INFRARED REFLECTANCE SPECTRA. M.Trivedi,[1] H.D. Smith,[1] and D.W.G Sears[1] 1Space Science and Astrobiology Division, NASA Ames Research Center, Moffett Field, CA 94035. E-mail: Mihir.Trivedi17@bcp.org,Heather.d.smith@nasa.gov* derek.sears@nasa.gov. * Corresponding Authors E—mail.

Introduction: Ordinary Chondrites, the largest meteorite group, are sorted into three classifications by the FeO in silicates and the amount of metallic Fe. These three classes (H, L, and LL) are divided into two petrographic types that reflect the metamorphic history of the parent body. The least altered type "unequilbrated" ordinary chondrites (UOC) are known as Type 3 and are subdivide from 3.0 to 3.9. The more altered type are known as "equilibrated" ordinary chondrites (EOC) and are subdivided into types 4-6. [1,2]

One characteristic of the two petrographic types is the form of pyroxene. In equilibrated ordinary chondrites the pyroxene is mainly orthopyroxene (OPX), which is also the dominate form of pyroxene on Earth. In the unequilibrated ordinary chondrites pyroxene is predominantly in the form of clinopyroxene (CPX). Thus the equilibrated ordinary chondrites and the unequilibrated ordinary chondrites could be distinguished based on the presence of clinopyroxene. For this research we validate and expand on the use of detecting and classifying Type 3 (UOC) using reflectance spectral properties of clinopyroxene.

Experimental Setup: For this study spectra on UOC's falls were obtained from the RELAB database and by laboratory measurements using an *ASD fieldspec spectrometer*. Meteorites considered in this investigating include H, L, and LL classes ranging from 3.2 to 3.9. We include UOC falls in the SI and NHM collections as well as those available on RELAB which include: Tieschitz, Mezo-Madras, Parnallee, Bishunpur and Dhajala to name a few.

The near-IR spectra for pyroxene contains two deep absorption bands, one at ~1 μm and one at ~2 μm, the exact wavelength and depth depend on the relative proportions of CPX and OPX. We estimated the position and depth of the 1 μm and 2 μm bands by direct measurement from the raw spectra and refer to the resulting CPX values as "visual" estimates. As a second approach we performed a spectrum analysis using the MGM software (developed by Sunshine et al. 1990[3]) which attempts to separate absorption bands associated with different minerals. For instance, Olivine has a band at ~1 μm and feldspar has bands at ~1 μm, ~2 μm and other wavelengths depending on composition. The ratio of the band strength of the OPX component to the band strength of the CPX component is determined from the MGM output and this is again calibrated using laboratory measurements described in Sunshine and Pieters[4] to find the amount of CPX in the pyroxene. Where previous data were available, our spectra showed reasonable agreement.

Meteorites Names: Tieschitz, Mezo-Madras, Parnallee, Bishunpur and Dhajala.

References: [1] Van Schmus and Wood (1967) Geochim. Cosmochim. Acta 31, 747-765. [2] Sears et al. (1980) Nature 287, 791-795. [3] Sunshine et al. (1990) J. Geophys. Res. 95, 6955-6966 [4] Sunshine and Pieters (1993) J. Geophys. Res. 98, 9075-9087.