IDENTIFYING 'BAD' ASTEROID SPECTRA: A CROSS-CORRELATIVE DATABASE STUDY. I. V. Gerasimenko[1] and M. J. Gaffey[1], [1]University of North Dakota. Email Addresses: ivgerasimenko@randolphcollege.edu and, gaffey@space.edu.

Introduction: Unless an object has a compositionally or petrologically heterogeneous surface, different observers should obtain similar spectra for individual asteroids and similar spectra should be obtained when a particular asteroid is observed at different times. Different spectra obtained by different groups or at different times could indicate a compositionally heterogeneous surface that would provide important insights into the nature and relationships of the object.

Compositionally significant inconsistencies were discovered between the SMASS I [1], SMASS II [2] and S^3OS^2 [3] asteroid spectral survey datasets during the analysis of asteroid (354) Eleonora [4 and this meeting, Fig. 1]. In the case of (354) Eleonora, we were able to eliminate the possibility that these spectral differences arose from real spectral diversity on the asteroid's surface, from observing geometry or from other known sources of asteroidal spectral variations. By "compositionally significant inconsistencies" we mean that if analyzed independently, the different spectra would suggest significantly different compositions and/or different taxonomic classifications, especially within the most diverse taxonomic systems [e.g., 5,6]

It is important to determine whether this is a problem unique to asteroid (354) Eleonora or whether it is a more pervasive problem with the survey datasets. If it is a widespread problem, serious questions could arise concerning the validity of the asteroid taxonomic classifications and the asteroid compositional determinations that have been based on the survey data. We have undertaken to investigate this question.

Methods: The research compares the visual and near infrared (VNIR ~0.4 – 1.0 µm; CCD data) wavelength spectral observations of individual asteroids from the existing large survey datasets (SMASS I, SMASS II, S^3OS^2) in order to identify which asteroids have inconsistent spectral data. Where available the smaller survey datasets of Sawyer [7] and Vilas [8-10] will be incorporated into the analysis. All the necessary data for this analysis is available from the Small Bodies Data Node of the NASA Planetary Data System (http://pds.nasa.gov).

Goal: Preliminary work indicates that the problem is not unique to asteroid (354) Eleonora. Figures 2 - 4 show examples of additional inconsistent data. The results of the investigation of 121 asteroids (of the first 200 asteroids) for which data is available in all three survey programs are summarized in Table 1. The research will eventually compare the spectra for all asteroids present in two or more of the survey data sets, and will tabulate the frequency of inconsistencies. If inconsistencies are widespread, the proposed work would investigate the systematics of inconsistencies in order to determine whether they arise from observational, data reduction or calibration problems (bad!) or whether they identify real surface differences on the objects (good!). The goal of this effort is to establish protocols for identifying "bad" spectra and eliminating such spectra from analysis efforts.

Figure 1: Asteroid 354 Eleonora spectra in visible wavelength. Normalized reflectance is plotted against wavelength. Note the prominent differences beyond ~0.75 µm between the SMASS II (red) and the SMASS I (yellow) and S^3OS^2 (green) data.

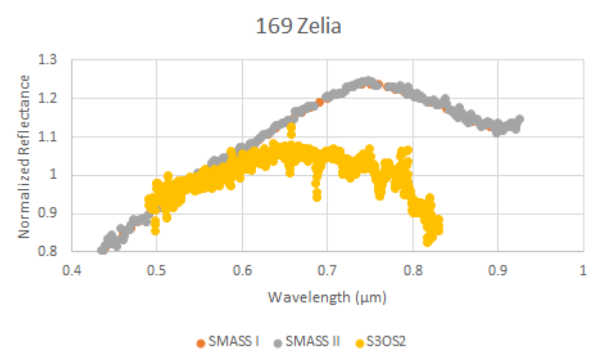

Figure 2: Asteroid 169 Zelia spectra in visible wavelength. SMASS I and II (red & grey) plot on top of each

other, while S^3OS^2 data (yellow) deviates significantly. Analysis of S^3OS^2data would lead to a different interpretation than that for SMASS data.

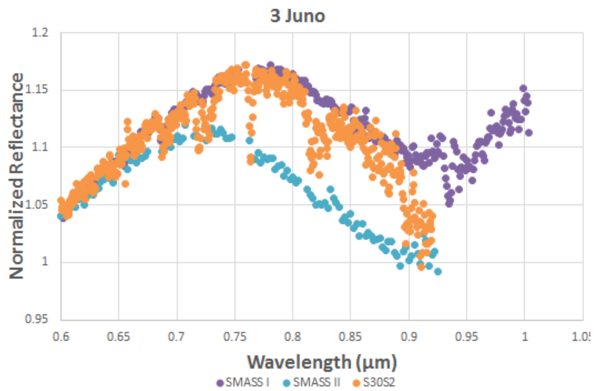

Figure 3: Different spectral curves obtained for (3) Juno by the SMASS I (purple) & SMASS II (orange) systems and by the S^3OS^2 (light blue) system.

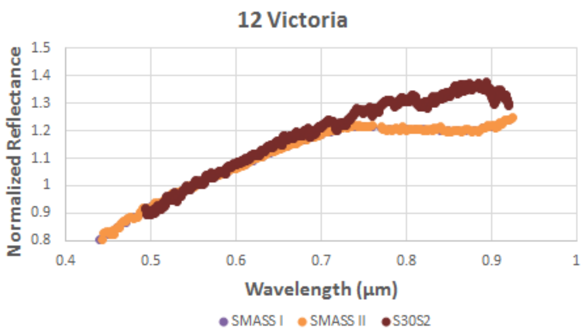

Figure 4: For (12) Victoria, the SMASS II (orange) data plots right on top of the SMASS I (purple) but deviate beyond ~0.73 µm from the S^3OS^2 (dark red) spectra.

TABLE 1
Results of Initial Investigation of the First 121 Asteroids with Data in All Three Surveys

Inconsistencies Observed	#	%
Between SMASS-I and SMASS II	2	1.7
Between SMASS and S^3OS^2	18	14.9
Total # of Asteroids Examined	121	100

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