NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

RESEARCH AND TECHNOLOGY RESUME

TITLE

Compositional Studies of Primitive Asteroids

PERFORMING ORGANIZATION

Space Science Branch
Solar System Exploration Division
Space and Life Sciences Directorate
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DESCRIPTION *(a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year, c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)*

a. Strategy of Investigation: The composition of primitive asteroids and their relationship to satellites in the solar system will be studied by analyzing existing narrowband CCD reflectance spectra, acquiring additional spectra of asteroids and small satellites in the 0.5 - 1.0 um spectral range, and exploring possibilities for obtaining compositional information in the blue-UV spectral region. Comparison with laboratory spectra of terrestrial chlorites and serpentines (phyllosilicates) and the clay minerals found in carbonaceous chondrite meteorites will continue.

b. Prior Accomplishments: During 1987, narrowband CCD reflectance spectra of 17 additional asteroids were acquired. These spectra and spectra of 34 other asteroids have been used primarily for two studies: weak absorption features similar to those due to Fe^{2+} and Fe^{2+} - Fe^{3+} transitions in iron oxides found in terrestrial chlorites and serpentines and carbonaceous chondrites have been identified in some primitive asteroid spectra. There is a first indication that asteroids grouped by heliocentric distance show similar weak absorption features. Nonparametric statistics are being applied to test the hypothesis of discrete remnants of a gradation in composition of outer-belt asteroids will be tested.

c. Planned Accomplishments: The implications for formation of primitive solar system materials will be addressed through the study of the weak absorption features in the existing CCD reflectance spectra of primitive asteroids. The data base of asteroid spectra will be enlarged. CCD reflectance spectra of small satellites in the solar system (Phobos and Diemos are targetted, because of the presumed C-class broadband photometry) will be acquired.

d. Summary Bibliography:

Vilas, F., Gaffey, M., McFadden, L., King, T. (1986) "A Search for Weak Absorption Features in CCD Reflectance Spectra of Primitive Asteroids", BAAS, v. 18, 796.

Vilas, F., and McFadden, L. (1987) "New CCD Reflectance Spectra of Outer Belt Asteroids", BAAS, v. 19, 825.

Vilas, F. and McFadden, L. (1987) "1 Ceres: Weak Absorption Features Between 0.53 - 0.6 um", BAAS, v. 19, 825.