arcsec to about 4.8 arcsec; even at the smallest angular size, images comparable to very good terrestrial photographs of the planet were obtained. The combined HST observations span more than one martian year, beginning shortly after the 1990 opposition and including a possible "dust storm season", the 1993 opposition, and winter through summer seasons in the martian northern hemisphere. Coverage of the northern winter and spring seasons was repeated.

Dramatic seasonal variability of some regional albedo features (such as Syrtis Major) was evident in Viking Orbiter observations obtained during 1976 — 1980. Such variability is thought to be related to redistribution of bright dust during and following major dust storm events. A comparison of the Viking observations to the 1990 — 1993 HST observations will be discussed.

02.02

EVIDENCE FOR A GLOBAL COMPOSITIONAL DICHOTOMY ON MARS

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The north-south morphologic and age dichotomy is a profound aspect of Mars geology. Yet there has been limited evidence for compositional variations which correlate with this geomorphic division. This has been interpreted by many to indicate that current surface materials on Mars are globally distributed, largely homogenized, and generally unrelated to the underlying crust. Recent evidence, however, has shown that this is not the case: there is significant regional and local compositional variation around the planet (e.g. Bell et al. **JGR 95** 1990; Singer et al. **Bull. AAS 22** 1990; Singer and Miller **LPI 92-02** 1991; Mustard et al. **JGR 98** 1993; Murchie et al. **LPSC XXIV** 1993; Geissler et al. **Icarus** in press 1993; Merenyi et al., **Icarus** submitted, 1993). The manifestations of these variations in remotely-sensed data are often subtle. We conclude, however, that a global compositional pattern is emerging. This result is based on the synthesis of various recent results by us and others, with emphasis on a series of visible and near-IR (0.44 - 1.02μm) spectral images obtained by us during the 1988 apparition (Singer et al. **LPSC XXI** 1990).

In summary, both high and low albedo materials currently exposed in the ancient highlands show more bulk crystalline hematite, implying weathering or other alteration which proceeded further towards equilibrium than in most of the lowlands. This may be a consequence of exposure age, but might also be related to differences in geologic processes and/or climate. Northern plains low-albedo regions, such as Acidalia Planitia and Oxia Palus, are also different in their mafic composition than observed low-albedo regions on older terrains. Near-IR Fe^{2+} pyroxene bands are observed centered between 0.92 and 0.99μm for highland exposures, while Acidalia, a large rocky plain in the northern lowlands, does not show a band minimum shortward of 1μm (where our data end). Various interpretations are possible for Acidalia, but we cannot yet choose among these with available data.

What is clear, however, is that there is now evidence for compositional differences which correlate with the long-known global morphologic dichotomy on Mars. We can also conclude that: a) the surface of Mars has not been completely resurfaced and homogenized by aeolian action; b) not all heavily weathered deposits are the same as each other or the global dust. Arabia, in particular, appears compositionally distinct from other large northern bright regions; c) the composition of at least some of the basaltic lavas in the northern plains differs markedly from those to the south.

02.03

High Resolution K-Band Spectroscopy of Mars During 1990 and 1993

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High spectral resolution telescopic observations of Mars were obtained during the 1990 and 1993 oppositions from Mauna Kea Observatory. During 1990, the IRTF CGAS spectrometer was used to observe ten 500-km regions at a spectral resolution of 1200-1500 from 2.10 to 2.47 μm [1]. These data were obtained simultaneously with near-IR imaging spectroscopic measurements discussed elsewhere [2]. During 1993, the UKIRT CGS4 spectrometer was used to obtain multi-pixel slit images of Mars at a spectral resolution of 350 from 2.04 to 2.46 μm. The 1993 data range from 500-1000 km spatial resolution and encompass about 70 spectra in total. Flux calibration (to within ±20%) of both of these data sets has been performed using IR standard stars.

Many interesting absorption features can be seen in these data sets. Most prominent are the strong CO_2 R-branch band near 2.05 μm and a weaker CO_2 band near 2.15 μm. Also, a broad but weak absorption in the 2.3 to 2.4 μm region can be seen and is attributed to atmospheric CO. The presence of these features in our flux calibrated data will allow us to accurately model the relative contributions of the Martian atmosphere and surface. As well, the presence of both strong and weak atmospheric bands may allow us to quantitatively derive the dust opacity during both oppositions [2,3].

Less prominent absorption bands are also seen in the data, and these features are tentatively assigned to mineralogic absorptions either on the surface or in the airborne dust. These bands are indicated in Table 1, along with the so-called "scapolite" bands observed by Clark *et al.* during the 1988 opposition [4]. There is enough overlap among the data sets from different oppositions to indicate that the features observed just outside of the Martian atmospheric CO region are probably real and are probably due to Martian bisulfate- and/or bicarbonate-bearing minerals, as proposed in [4]. Features observed inside the CO region require additional modeling to adequately separate the gaseous vs. mineralogic components [*i.e.*, 5]. There is evidence in a few of the spectra for weak features near 2.20 and 2.25 μm, consistent with previous interpretations of weak phyllosilicate and/or bisulfate/bicarbonate absorptions in these regions [2,4,6]. More specific mineralogic inferences from all of these data will be possible only after more detailed modeling and understanding (not "removal") of Mars atmospheric absorptions.

TABLE 1: Mars K-band Absorption Features Detected in 1988, 1990, and 1993.

1988 [4]		2.15		2.25*	2.29	2.33	2.36	2.39	2.41	2.44
1990 [1]		2.15		2.267*	2.301	2.333	2.347	2.400		
1993	2.05	2.15	2.20*	2.25*	2.295	2.330	2.360	2.385	2.415	

* means that the feature was only observed in a few selected spectra

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02.04

A New Type of Weathered, Immobile Soil Unit On Mars

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In the past few years, extensive VIS-NIR spectral analysis work has been done to investigate the compositional variability of the Martian soils. Recent research by Pinet and Chevrel (JGR *95* 1990) from high spatial resolution CCD imagery at selected wavelengths, by Mustard *et al.* (JGR *98* 1993), Murchie *et al.* (PLPSC *XXIV*), from high spatial and spectral resolution Phobos ISM data, by Singer *et al.* (PLPSC *XXI* 1990), Singer and Miller (MSATT 1991), Miller and Singer (PLPSC *XXIV* 1993), Bell *et al.* (JGR *95* 1990, PLPSC *XXI* 1990), Merényi *et al.* (PLPSC *XXIII* 1992, Icarus 1993, submitted) from high spectral resolution telescope imaging has shown a considerable variation of surface materials among bright regions as well as across dark albedo units. It has generally been observed and argued that dark regions exhibit greater variability than bright regions. Dark region spectra show evidence for mafic mineralogy, bright units are more altered. There are also examples of areas where the spectral properties strongly correlate with the physical characteristics of the soil.

Here we follow up on previous work regarding a medium albedo unit, Deucalionis Regio, centered at (245 ° W,15 ° S), which seems to be covered with a previously unreported type of soil. It is distinguished from the surrounding classic regions of Arabia, Sinus Meridiani, Oxia and Acidalia in the 0.4-1.0 μm range. The spectra suggest that this area contains more pyroxene than Arabia and less than Sinus Meridiani. The crystalline hematite content appears greater than either in Arabia or Meridiani. Yet, Deucalionis cannot be modeled as a simple mixture of the nearby dark and bright units. Its physical characteristics, as derived from Viking IRTM data, indicate an immobile soil, maybe cemented by salts. We expect to test the mineralogical distinction with Mars Observer Thermal Emission Spectrometer in the future. The geographic extent of the spectral and physical anomalies show strong spatial correlation, which suggests a possible genetic tie. Very similar spectral and physical properties seem to be spatially correlated over another large area, Noachis. The anomaly of Deucalionis Regio was brought to our attention by the analysis of a telescopic spectral image. Recent work on another, similar image cube confirms the previous reults.

02.05

Search for Small Scale Ferric Oxide Mineral Deposits on Mars

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In preparation for the arrival of Mars Observer, we have begun a program of systematic examination of the Viking Orbiter multispectral imaging data for evidence of color anomalies indicative of ferric oxide mineralization. The motivation for this study is the interpretation of color anomalies observed in the central Valles Marineris to be due to local concentrations of hematite (αFe_2O_3) [1-3]. The mineralization occurs in two small depressions on the margins of Hesperian-aged layered deposits in West Candor Chasma. The distinct coloration is caused by the absorption edge of Fe^{3+} in hematite at 0.53 μm, which coincides with the Viking green filter center wavelength [4,5].