OBSERVATION OF THE MARTIAN CRYPTIC REGION FROM MARS ORBITER CAMERA J. J. Jian and W. H. Ip Institute of Astronomy, National Central University, Taiwan (d909003@astro.ncu.edu.tw, wingip@astro.ncu.edu.tw)

Introduction: The distribution of the Martian south pole is not symmetric during the springtime retreat. On the opposite side of the residual cap a so-called cryptic region is found between latitudes 75^0 and 85^0 and longitude 150^0 W and 310^0 W [8]. A major puzzle about the cryptic region is that the albedo appears almost as dark as the bare ground but the surface temperature still remains cold. The area occupies the same area from year to year. There are several special surface features in the cryptic region, for example, spider ravins, fans, and Dalmatian spots according to the MOC observations[10]. It is also unique in the thermophysical properties compare with the rest of cap from the TES and IRTM data. It is darker and slightly warmer than the rest of polar cap. Use 15- micron atmosphere band of the TES shows that the cryptic region has less spectral contrast than the rest of polar cap [8].

The formation of these surface features might be controlled by the seasonal evolution of the surface ice layer (see Figure 1). For example, one possible explanation of the formation of cryptic region is that dust grains embedded in the condensed CO_2 slab would sink to the bottom under heating by solar radiation [5]. For transparent ice slab the surface temperature will be kept low while the bottom layer of accumulated dust will lead to a low albedo. It means that the cryptic region may be composed of ice mainly according to this model.

Data analysis and Results: In the present work a preliminary statistical study of the occurrences of different surface features in the cryptic region as functions of Ls is made with a view to trace the relation between the spiders and fans and the cycle of CO_2 ice condensation and sublimation. Images used in the analysis are mainly from the Mars Orbiter Camera (MOC) onboard Mars Global Survey (MGS). As the High Resolution Stereo Camera (HRSC) on Mars Express is currently imaging the South Pole, we hope to be able to supplement the MOC data set with the new HRSC observations. We analyse the MOC narrow angle images at latitude from $80^0 \sim 87^0$ S and longitude from $140^0 \sim 330^0$ W which were obtained between September 1999 and March 2005. The cyan areas in Figure 2 and Figure 3 show the coverages of the MOC narrow angle images betweem August 2001 and January 2002 and between October 2003 and March 2004, respectively. In this study, we find the existence of the spider and fan features beween latitude 75^0 S - 87^0 S and longitude between 180^0 W and 300^0 W. What is interesting is that the characteristic landform of vents (see Figure 1A) tend to appear before Ls ~ 250^o and the spider features (see Figure 1B) tend to appear after Ls ~ 240^o when the CO_2 ice sublimates quickly. Such behavior could be the result of the seasonal modulation of the ice sublimation process as proposed before . It could also be related to the atmospheric conditions and wind patterns in the South Pole from season to season. A detailed study of the temporal and latitudinal variations of these special surface features in combination with the HRSC and OMEGA observations will provide deeper insight to this long-standing enigma.

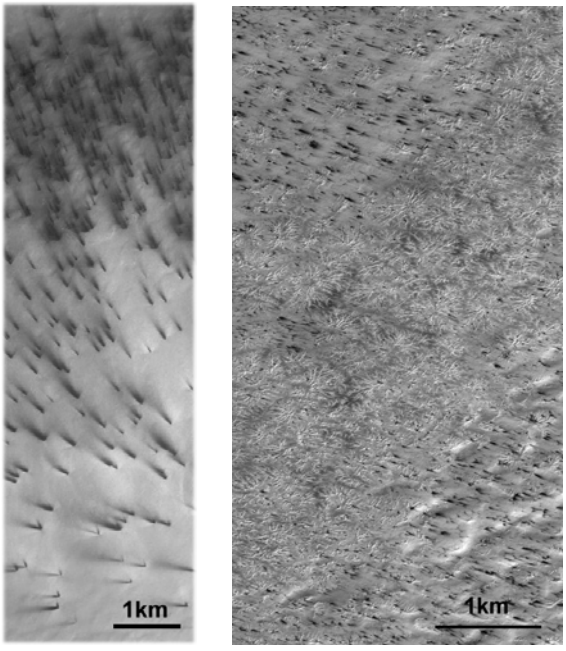

Figure 1:(A)MOC narrow angle image E07-00159. During the spring (LS =207.53) , the CO_2 ice might be sublimating from the bottom leading to the formation of vents that allow gases to escape. The ejected material falls downwind to form fans according to the wind direction. Image centered at Lat. 265.63°W , Long. 86.32°S, resolution 11.06 meters. (B)MOC image R08-01280 during summer(Ls = 242.29) shows "spider" features. Image centered at Lat. 224.36°W, Long. 87.18°S ,resolution 2.88 meters.

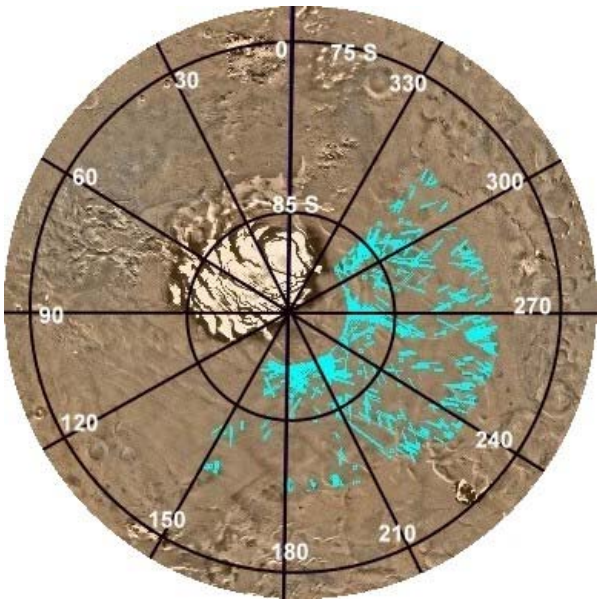

Figure 2 : This map shows the observation of MOC. The cyan areas mean the positions of narrow angle images .The top is 0^0 W longitude and increase in 30^0 increments counterclockwise. The observation time is between August 2001 and January 2002.

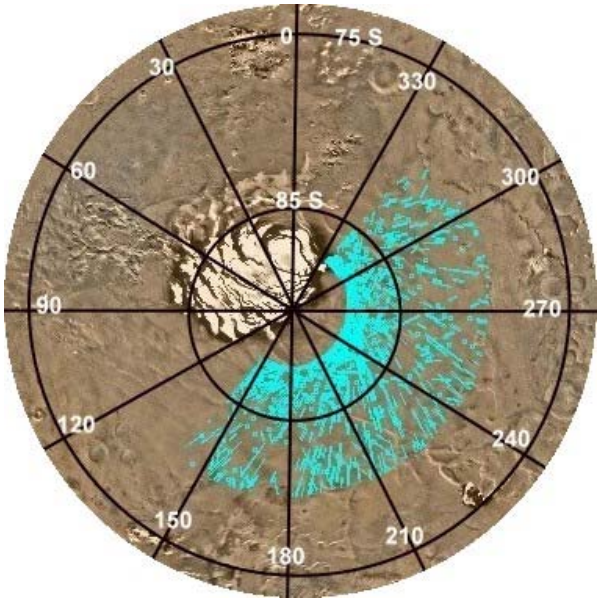

Figure 3 : This map shows the observation of MOC. The observation time is between October 2003 and March 2004. The cyan areas mean the positions of narrow angle images . The grid lines are the same as in Figure 2.

Acknowledgment: This work is supported by NSC 94-2111-M-008-033 and NSC 94-2112-M-008-002. We thank Gerhard Neukum and J-P Bibring for useful discussions.

References:

[1] Brightwell S. N. et al. (2003) *LPS XXXIV* , Abstract #2077. [2] Colaprete A. et al. (2005) *Nature* , 435, 184-188.[3] Forget F. (2004)*Sci*., 306,1298.[4] Kieffer H. H. et al. (2000) *JGR*, 105, 9653-9699. [5] Portyankina G. et al. (2003)*Third Mars Polar Science Conference*, Abstract #8026.[6] Sylvain P. et al. (2003) *JGR*, 108, E8, pp. 3-1.[7] Titus T. N. et al. (2002) *LPS XXXIII* , Abstract #2071.[8] Titus T. N. et al. (2003)*Third Mars Polar Science Conference*, Abstract #8081. [9] Titus T. N. et al. (2005) *LPS XXXVI* , Abstract #1993. [10] Zuber M. T.(2003)*Sci*.,302,1694.