Preliminary Results of the Airborne Hyperspectral Remote Sensing Applied to the Antarctic Meteorite Survey. S. Kalmár[1] and A. Gucsik[2,3], [1]Savaria University Center, University of West Hungary, Károlyi Gáspár tér 4., H-9700, Hungary; [2]Osaka University, 1-1 Machikaneyama, Toyonaka, Osaka 560-0043, Japan; [3]Konkoly Observatory of the Hungarian Academy of Sciences, H-1121 Budapest, Konkoly Thege Miklós út 15-17., Hungary;

Introduction:

Recently, Kalmár et al. [1] discussed the possible and potential techniques used for carrying the camera system such as Aircrafts, Radio-controlled (RC) model airplanes and Unmanned Aerial Vehicle System (UAV) applied to the Antarctic Meteorite Survey.

Pursuing the above-mentioned research project, the aim of this study is to provide further results our preliminary examinations of the surficial survey of the meteorites in Antarctica using airborne techniques as follows.

Testing the Radio-controlled (RC) model airplanes and GPS-controlled Quadrocopter:

Radio-controlled (RC) model airplane

Using the RC model airplanes (Fig. 1) provides an alternative opportunity, which can carry the hyperspectral camera on its board. Furthermore, the critical point of this technological development is the weight of the camera. For the reason of the Antarctic meteorite research proposals, it is also possible to use the selective and characteristic spectral features operating conditions indicating the light camera options. Compared to the aircrafts, this system is relatively cheap. However, this technique has some disadvantages operating in the Antarctic environment including the instability against the lateral wind system as well as restricted capability for obtaining high-resolution images especially at relatively low altitudes.

GPS-controlled Quadrocopter

The net weight, which is carried on board of our quadrocopter is about 1.5 kg (Fig. 2). This operates about one hour in the air with permanent GPS controlling, which might be corrected in the RC operating conditions, too. The quadrocopter is able to fly in the self-controlled or automatic operating conditions as well. The weak point of this system is that there are some difficulties in controlling strong wind (above 7-8 m/s wind).

Hyperspectral Imaging

According to Bishop [2] the spectroscopic properties of particulate, for instance, ALH 84001 from 0.3 to 25 μm identify low-Ca-pyroxene. Absorption bands due to electronic transitions of ferrous iron are observed at 0.94 and 1.97 μm that are typical for low-Ca-pyroxene. A strong, broad water band is observed near 3 μm that is characteristic of the water band typically associated with pyroxenes.

It is important to note the above-mentioned imaging systems are still under our investigations. Alternatively, a thermo-camera will be also tested carried on board of the RC model airplane as well as quadrocopter.

Conclusions

In general, the hyperspectral camera operating at the maximum range of the electromagnetic spectrum (0.4-2,5 μm) has a weight at around 50-80 kgs. In this case, compared to the RC model planes and quadrocopter, the most suitable solution to carry these instruments is usage of small aircrafts. The major disadvantage of this method is costly, and requires to have a well-graduated stuff as well as hard to use it in the Antarctic conditions, especially.

Figure 1. *A radio-controlled (RC) model airplane*

Figure 2. *A GPS-controlled quadrocopter*

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References: [1] Kalmár S. et al. (2009) *32nd Antarctic Meteorite Symposium*, NIPR, Tokyo, p. 26-27. [2] Bishop J.L. et al. (1998) *Meteoritics & Planetary Science*, vol. 33, no. 4.