Distribution of tailing minerals deduced from remote sensing data in Bor mining area, east Serbia

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City of Bor is located in east part of Republic of Serbia. The exploitation of copper ore has been operated since 1903. Main types of the copper ore in Bor ore deposits are massive sulfide copper deposits, vein and stockwork-disseminated type of mineralization, porphyry mineralization, and reworked ore-clasts of copper sulfides. Underground mining and open pit mining carry out exploitations of ore. In the five-year-period, between 2010 and 2014, Mining and Smelting Combine Bor produced 155 thousand tons of copper, 24 tons of silver, and 4.5 tons of gold. Mining activities have produced large amount of waste materials. Until now, it has been disposed 450 million tons of overburden, 207 million tons of flotation tailings and 23 million tons of slag. Pyrite from the tailings is exposed to water and oxygen, which leads oxidation of this mineral and production of acid mine drainage. Releasing untreated acid mine drainage and wastewater from smelter into a river is a reason of serious environmental pollution. Fine-grained flotation tailings transported by winds and river water become air and soil pollutions and river sediment. In order to make comprehensive environmental evaluation and propose reclamation system, collaboration between Japan and Serbia has been started in 2015. This project is supported by SATREPS from JICA and JST. The project will be continued until 2020. This project has two main research groups; environmental evaluation group, and detoxification and resources recovery group.
Environmental evaluation group studied about distribution of tailings and wastewater deduced from satellite image data analyses. In 2015, the group members researched about tailing distribution by using satellite images. First, tailing positions were extracted from ASTER and LANDSAT images. Because spectrum of the tailing had decay slopes in Band 3 images in both of ASTER and LANDSAT, the tailing areas were identified from ratio between Band 2 and Band 3 of these images. ASTER and LANDSAT images were not able to distinguish between soil and tailing because of their wide Band ranges. Therefore, the members distinguished tailings from seasonal changes of spectrum in these areas. The seasonal change was caused by vegetation. Next, 22 samples of surface materials were took and observed. Almost surface materials matched satellite analysis results, but a few areas were different from the satellite analysis results. These 22 samples were analyzed spectrum by a spectrometer and determined mineral by XRD. These spectrum data were compared with satellite images. In addition, high-resolution images (World View 2) were purchased and analyzed with other images and data. Especially, Vrazogrnac plane where was confluence of Bor and Timok Rivers. Timok River connects to Danube River.
Environmental evaluation group would reveal from material content with depth in future drilling works. Spectrum data was correlated with XRD data. XRD result showed that tailing samples were including Jarosite, Kaorinite, Illite, and Gypsum. Vrazogrnac area was measured secular change and collected samples. There were also compared with spectrum data. High resolution images around there were also measured the areas in details.
These tailings would be transported to Danube River, the international river, then they could make around countries environmental influences. Our study would resolve the problems by continuing our observation about distribution of tailings. In order to research in details, we should prepare hyper spectrum images. Acquirement of images from Hyperspectral and/or LCTF-UAV would resolve these problems in the future.

Keywords: remote sensing, mining, tailings, pollution, Bor

The use of the disaster food as space foods -Dietary nutrients in one week- (Thought from salt density)

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It is necessary to grasp quantity of salt in the meal to prevent high blood pressure. The low salt diet is necessary in the space. It is effective to use disaster food as space foods. We can store the disaster food at normal temperature for from three years to five years. We made a one-week menu with a combination of disaster food. We make one week menu by using marketing product of disaster food. That menus are containing less than 10g of quantity of salt.

Keywords: Space foods, Disaster food, Salt density, Marketing product

Instruction only with the meal based on the gene analysis result for quantity of muscle increase -state of weightlessness -

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On the earth, various trials are carried out now to improve metabolic syndrome. In a diet class, people try to reduce fat and to build muscle. Dieting and exercise load are important to reduce the weight. However, the gene analysis is necessary to reduce fat and to build muscle. We did analyze the gene of subjects. We instructed the subjects to lose their weight by using our protocol. In this protocol, the subjects effectively lose their weight. To do the exercise is difficult in the space.
Therefore after having performed gene analysis, this study performed only meal instruction and tried weight loss. As for the present, there are many people who cannot get exercise time because of their busy work. Weight loss instruction to perform only by meal dieting is required. We can apply this result on not only the space environment but also the earth.

Keywords: Quantity of muscle, Gene analysis, Dietary formula, Percent of body fat

The use of the disaster food as space foods - The hyperglycosemia prevention by the blood sugar level measurement after a meal-

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It is necessary to be able to store the space foods at normal temperature more than three years. It is the same as disaster food used on the earth now. Preservation characteristics and simplicity have priority over nourishment balance in the disaster food. However, in the case of space foods, the nourishment balance for health care in the long-term stay is more important. It will be essential in future to perform meal management about sugar and the salt in space foods when space stay thinks about a thing for more than one year. It will be essential in future to perform meal management about sugar and the salt in space foods when space stay thinks about a thing for more than one year. We tried to make a week menu to think about salt intake. We think that we can apply disaster food to space foods if this can be settled. Our menu include less than 10 g salt per a day. We made space foods menu by using the marketing product. And we measured the blood sugar level. We hope that will be helpful on both the space and the earth.

Keywords: Space foods, Disaster food, Blood sugar level, Marketing product

Herb cultivation study in the space station
-Fundamental experiment result on the ground-

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There is plant cultivation planned in a space station. Japan participates in a plan in Asia, too. The plant has some kinds of candidates.
Sweet basil, Peppermint, Chinese holly basil.
We cultivated 30 days each. A fast-growing plant is necessary. We show the growth record of each plant. This result is changing by temperature and illumination.
I would like to show you our possibility of space agriculture.

Keywords: Plant, Cultivation, Space station, Basil, Plan in Asia

