Sedimentary Characteristics of Source Areas of Asian Dusts (Yellow Sands)

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1. Introduction

Source regions and characteristics of Asian Dusts (Yellow Sands) is important to understand in order to determine the influence of Asian Dusts (Yellow Sands) into Korean Peninsula and surrounding areas. The purpose of this study is to find the sediment characteristics of Asian Dusts (Yellow Sands) source areas and to compare among different source regions such as the western China, northeastern China (Inner Mongolia) or loesses. Sediment samples were collected from February to March of 2002. In this paper, mainly, the results of grain-size analysis are mentioned and discussed. Grain-sizes from loesses are clearly different from the desert sediments in China. That is, the distribution of grain-sizes from loesses is mostly in the range of silt to very fine sand. However, sands are dominant in the desert areas and quartz are a major mineral composition. Especially, sedimentary characteristics of the Hungshan Dake Desert of the inner Mongolia is very coarse. Therefore, this Hungshan Dake Desert is very different from the sedimentary characteristics of the other desert in China, especially the western side of China.

2. Materials and Methods

The study area is mainly divided into three areas: the desert of northwestern China (including Minquin and Gobi Desert), Shapoto Desert and Loesses, the Inner Mongolia of northeastern desert.

In order to remove organics from the sediments, 10 ㎛ Grain-size analysis of sediments is done by a sieving method for the sediments larger than 63 μm, and by a pipette method for the sediments smaller than 63 μm. Coarse sediments greater than sand size (> 63 μm) sieved in 0.5 φ interval by the rotap shaker, while fine sediments (silt and clay size) are analyzed by the sedigraph 5100D machine.

3. Results and Discussion

At least four areas from Chinese desert and loesses are divided to find size differences of sediments. They are Lanzhou loesses and adjacent areas, the west desert of China including Shapoto Desert, Gobi Desert, Inner Mongolia desert in the northeast of China. Grain-size distribution of Lanzhou Loesses is composed of 5% of sand, 72% of silt, and 23% of clay which shows the dominance of silt distribution. Among silt sizes, he percentage of 0.0442 mm (4.5 φ) ~ 0.0156 mm (6 φ) sizes are about 38 % of silt sizes. Because part of this size range matches with the size range of. Asian dust, this particle sizes are important for understanding the potential Asian Dusts (Yellow Sands) source areas.

On the other hand, poorly-sorted sand particles are dominant in the Shapoto Desert even though loesses and this desert are nearby. The sediments from this desert are composed of almost 99.98% of sand, 0.02% of silt and no or trace amounts of clay. Among sands, 0.1768 mm (2.5 φ) ~ 0.0884 mm (3.5 φ) are the most dominant sizes.

In the area of Minquin of west China, the sand-sizes are dominant with the composition of 60 ~ 75 % of sand, 20 ~ 30 % of silt, and 5 ~ 8 % of clay. Among sand-sizes, The sizes of 0.125 mm (3.0 φ) ~ 0.044 mm (4.5 φ) are the most dominant which are the range of fine sand to coarse silt.

Sand dunes from Shandan Desert are composed of about 96 % of sand and about 4 % of silt, but sediments adjacent to the Great Wall are composed of the size of silt to clay which are well matched with loess sediments. In this region, the ranges of 0.031 mm (5 φ) ~ 0.0039 mm (8 φ) and 0.0221 mm (5.5 φ) ~ 0.0110 mm (6.5 φ) are dominant which are the size of medium silt to fine silt. The sediments of Great Wall is believed to be transported by man.

On the other hand, sand dunes are well developed in the Baidan Jardan Desert which contains about 93 ~ 96 % of sand and about 4 ~ 7 % of silt. However, the Gobi Desert comprises various grain sizes, mainly composed of gravels and sands. The distribution of grain size from the Gobi Desert contains about 23 % of gravel, about 46 % of sand and about 18 % of silt, and about 13 % of clay. If the gravel is excluded, the dominant sizes are ranged from 0.1768 mm (2.5 φ: fine sand) to 0.0884 mm (3.5 φ: very fine sand). The grain-size distribution from sedimentary sequences in the Gobi Desert are similar vertically. The majority of sediments from the Inner Mongolia such as the Hungshan Dake Desert is about 80 ~ 90 % of sand.

4. Conclusions

1. Desert and loess sediments are analyzed for grain-size distribution for the sediment

source areas of Asian Dusts (Yellow Sands) in China.

2. The distribution of grain-sizes from loess areas ranges from fine sand to silt, while that from the Shapoto, Baidan Jardan and Hungshan Dake Deserts are composed of mostly sands.

3. The variable ranges of grain-size distribution are found from the Gobi Desert which might be not a good source areas for the Asian Dusts (Yellow Sands).

4. Differentiation of grain-sizes should be continuously surveyed regionally for data compilation in order to cover the large Asian Dusts (Yellow Sands) source areas.