PEDIMENT PROBLEMS IN KOREA

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A piedmont gentle slope truncating bedrock and/or with very thin gravel layer was firstly described by Gilbert (1877). McGee (1897) designated the piedmont gentle slope as pediment. Many pediments have been reported mainly in arid areas, such as the western U.S.A. and Australia (e.g., Mammerickx, 1964; Dury, 1966; Denny, 1967; Warnke, 1969; Cooke, 1970; Cooke and Reeves, 1972; Oberlander, 1974, 1997; Twidale, 1978, 1990; Akagi, 1980; Parsons and Abrahams, 1984). Pediments are distributed all over the world (Cooke et al., 1993) including temperate humid regions, such as Korea (e.g., Chang, 1966, 1972, 1973).

Various hypotheses concerning with the formative processes of pediment have been propounded: (1) sheet wash erosion (e.g., McGee, 1897), (2) lateral erosion (e.g., Gilbert, 1877; Johnson, 1932), (3) weathering processes (e.g., Mabbutt, 1966; Twidale, 1967; Dzulynski and Kotarba, 1979), and (4) composite process (e.g., Bryans, 1923; Davis, 1938; Rahn, 1967). These hypotheses are, however, very complicated. Pediment problems, therefore, have not yet been completely resolved. The origin of Korean pediments also has not been resolved. The origin of the piedmont gentle slopes in the Korean Peninsula have been studied by many Korean researchers (e.g., Chang, 1966, 1972, 1973, 1974, 1976, 1977, 1978, 1980, 1997; Kim, 1966, 1973; Park, 1975; Ko, 1976; Chang and I, 1982; Lee, 1982, 1983; Kim, 1983; Park, 1983; Yoon, 1983; Yu, 1983; Kim and Jeon, 1988; Choi and Shin, 1995) and also by a Japanese researcher (Akagi, 1965, 1971, 1974, 1975). These studies can be grouped into the following three categories, based on the proposed origin of gentle slopes, i.e., 1) arid pediment (Kim, 1966,1973; Akagi, 1965, 1971 1975), 2) Etchplain (Chang, 1966, 1972, 1973, 1974, 1976, 1977, 1978, 1980, 1997; Chang and Lee, 1982; Kim, 1983), 3) Alluvial plain (Chang, 1987; Choi and Shin, 1995; Ono, 1990; Yoon, 1983).

These explanations can be classified into two groups based on the process of formation: erosional surfaces resulting in pediments and etchplains, and depositional surfaces resulting in alluvial fans. We hereby point out that depositional surfaces partly belong to colluvial slopes of periglacial origin formed in the Last Glacial age, based on our field observations, and point out unsolved problems as follows.

The piedmont gentle slopes of periglacial origin are located in the Changheung district, Cholla Nam-Do, in the southwestern part of Korea. The ridges of both Mt. Saja and Mt. Oekpul are composed of andesite and the piedmont gentle slopes are composed of granite (Chang and Kim, 1967; Choi and Yoon, 1968). The piedmont gentle slopes are covered with poorly sorted deposits, about 5-m in thickness, including subangular boulders with maximum diameter of about 1m. These gravel layers are not thought to be fan deposits, judging from the

facies, because the mountain slopes behind are relatively smooth and without streams.

The slopes, similar to those of the Changheung district, have already been reported in western Japan as "smooth depositional slopes"(Oguchi, 1986) and "colluvial slopes" (*Rokusetsu-men* in Japanese) (Tanaka et al., 1986). These slopes were deduced to be formed by slow mass movement, such as solifluction, during the Last Glacial age, based on tephrochronology and ^{14}C datings. Oguchi and Tanaka (1998) pointed out that the periglacial landforms of the Last Glacial are distributed even in the southern part of the Korean Peninsula. Kwon (1978) also reported the occurrence of a block fields in the southernmost part of Korea. Oguchi and Tanaka (1998) attributed the occurrence of these periglacial landforms to widespread grass vegetation in the Last Glacial.

Pollen analysis performed by Yoon and Jo (1996) in the Youngyang Basin, in the southeastern part of the Korean Peninsula, revealed that the dominant vegetation during the Last Glacial age was grassland. It is very possible that the piedmont gentle slopes of the Changheung district are not erosional but depositional, the opposite of the case of the Ichon district where piedmont gentle slopes of erosinal origin are widely distributed. Besides, periglacial processes such as solifluction possibly deposited the gravel layers. Grassland is widely distributed in present Mongolia whose climate is characterized by cold and dry "Steppe Climate" similar with the climate of Korea during Last Glacial age. So, it is necessary to observe the present geomorphic process in Mongolia to clarify the origin of Korean pediments.

Most of the Korean piedmont gentle slopes are composed of granite or gneiss (e.g., Chang, 1966, 1997; Kim, 1966; Akagi, 1975). Similar conclusions have been reached in arid regions (e.g., Oberlander, 1974, 1997; Twidale, 1978, 1990; Akagi, 1980). These works, however, only point out the apparent relationships between landforms and rocks, and offer no quantitative examination of rock properties. Matsukura et al. (1998) recently studied how bedrock properties affect the slope profiles on the structurally controlled landforms at Mount Dalma, in the southwestern part of Korea. Glacis pediment is composed of gneiss whose susceptibility to weathering is relatively high; in contrast to this, the hogback is composed of quartzite with low susceptibility to weathering. The quantitative studies on the relationships between formative process of pediments and rock properties must be accumulated in Korea. Moreover, the comparative studies based on landform material science between Korea and Mongolia must be carried out and accumulated in order to clarify the formative processes of pediments.

The origin and formative processes of *Korean pediments* have not yet been completely resolved. Especially, it is important to consider the following problems: (1) the relationships between the periglacial processes and colluvial slope formation, and (2) and the formative processes of pediments based on the field or laboratory measurement of rock properties.