

STUDY OF AEOLIAN MASS FLUX ESTIMATION ON COASTAL ENVIRONMENTS USING IMAGE ANALYSIS

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ABSTRACT

Sand transport by wind (aeolian transport) is a factor that plays a decisive role in the accretion process of beaches and dunes (de Vries et al., 2012). Study on aeolian transport began in 1941 when Bagnold established the aeolian mass flux equation for dry desert conditions. In the field of coastal engineering, aeolian transport study began in 1980s by applying the Bagnold equation to the coastal environment. It has been suggested that Bagnold equation overestimated the mass flux of aeolian transport of coastal area compared to dry desert conditions (Hoonhout and de Vries., 2016; van Rijn and Strypsteen., 2020), because the coast has high moisture, vegetation, and various materials such as seashells mixed with sand.

Many researchers have been investigating using various aeolian sand traps and wind tunnel experiments to analyze aeolian transport in coastal environmental conditions (Barchyn and Hugenholtz., 2010; Davidson-Arnott and Bauer., 2009). Nickling and McKenna Neuman (1997) developed a wedge-shape aeolian sand trap with collection rate of about 90% through wind tunnel experiment. Bauer and Namikas (1998) developed T-BASS, which can obtain time series data of aeolian transport amount by modifying a meteorological rain gauge connected to a load cell.

However, the problem with aeolian sand traps is that the collection performance varies depending on the sand trap. Goossens et al. (2000) compared the performance of five sand traps and found that performance differences of 70 to 120% could occur by wind velocity. Due to this difference in sand trap performance, the accuracy and reliability of the results are also inevitably lowered. In addition, the aeolian sand trap has the disadvantage of causing disturbance by affecting the wind flow and the trajectory of the aeolian transport (Goossens and Offer., 2000).

This study suggested a non-intrusive calculation method of aeolian mass flux using image analysis. By analyzing the wind tunnel experiment using image analysis, we aim to present aeolian mass flux estimation technique suitable for coastal environments. Also, with the suggested methods, the influence of coastal environmental factors such as moisture, vegetation, and shells on aeolian mass flux was examined. Unlike existing aeolian sand traps, it has the advantage of being able to measure sand velocity and concentration caused by wind. It is expected that more quantitative analysis will be possible.

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