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Development and improvement of the wind resources map over South Korea

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Renewable energy has been researched in many countries to restrict the emission of CO_2 by substituting the fossil fuel to reduce the global warming. Recently, there has been growing penetration of renewable energy in Korea. Wind energy is one of the most cost-effective energy sources compared with other renewable energy sources in Korea. Since wind energy capacity depends on wind speed, wind resources map can provide the most suitable location for wind power generation.

We developed 1-km horizontal resolution wind resources map over South Korea by using the numerical model WRF (Weather Research and Forecasting). We also developed 333-m horizontal resolution wind resources map which conducted numerical experiments using LES (Large Eddy Simulation) model to resolve turbulent features explicitly over the complex terrain with 333m horizontal resolution. In order to investigate the effect of complex terrain, we used high resolution of 100-m grid spacing topography data and 30-m grid spacing land-use data for lateral boundary condition.

The wind resources map with 1-km grid resolution over Korea includes hourly wind variations during the TMY (Typical Meteorological Year) for 1998 $\sim$ 2008. It shows abundant wind energy potential over the mountainous region and southwestern coastal region over South Korea, especially in spring and winter season. 1-km and 333-m wind resources map over the complex mountainous region such as Gang-won province showed well agreed with observed data at AWS (Automatic weather station). Moreover, we found that the 333-m wind resources map is more corresponded wind features over the complex terrain of Korea. After post-processing the 1-km wind resources map by using the GIS (Geographic Information System) tools, we have been displaying on web site (http://www.greenmap.go.kr) to provide these wind information for wind energy companies, experts in renewable energy and end users.