RHEEM LAB.

[Sea Surface Measurement by Active Microwave Remote Sensing and Development of Ocean Renewable Energy]

Center for Integrated Underwater Observation Technology

Ocean Environmental Engineering

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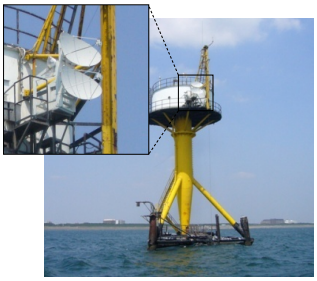
Remote Sensing of Sea Surface by Microwave Pulse Doppler Radar

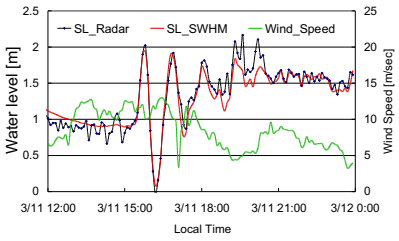
A real-time sea surface observation system by using a microwave pulse Doppler radar has been developed. This system is installed on a coastal site or an offshore platform and can observe various ocean phenomena, e.g. tsunami, tide and wave. The features of the radar are as follows.

○Real-time observation ○Remote sensing ○Easy maintenance

These advantages are effective in countermeasures against coastal disasters. We have also developed sea ice monitoring radar to use in the cold ocean. Using the difference in microwave backscattering from the sea and ice, sea ice position and speed are observed in high resolution.

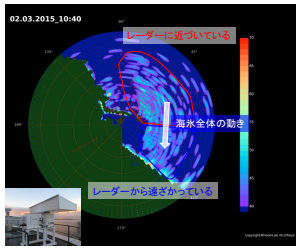


Hiratsuka experimental tower and microwave Doppler radar



Tsunami on March 11, 2011

microwave backscattering experiment on icebreaker



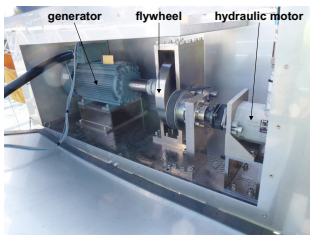
Sea ice observation using microwave Doppler rader

Development of Marine Renewable Energy

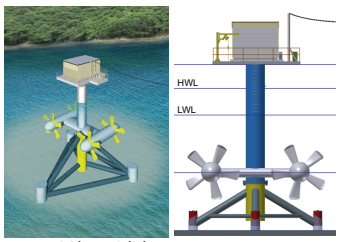
Renewable Energy is expected as a sustainable energy source which is less carbon dioxide emission. The most important thing is development costs, and the costs depends on the system efficiency. We need to improve the total system efficiency. We are now using hydraulic drive system and developing the high efficiency power generation system which is suitable for adapt to oceanic energy.

5kW tidal energy converter was installed in Shiogama-shi, Miyagi in 2014. The rated output of this power station is only 5kW, but it is very useful as a field test site. We have also developed 100kW tidal energy converter and will plan to expand this system to 250kW in future.

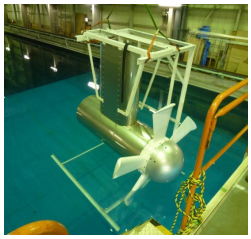
Installation of 5kW tidal energy converter



Power generation system

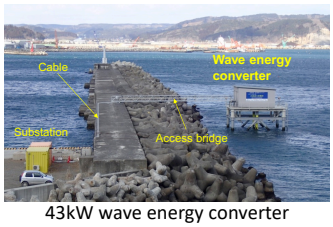


100kW tidal energy converter

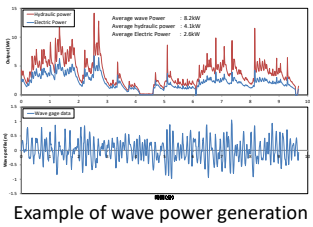


Roter test in water tank

43kW wave energy converter was installed in Kuji-shi, Iwate in 2016. It was confirmed that the efficiency is almost same as wind power generation (efficiency 32%). In future, we will plan to develop array system of wave energy converters to expand the scale of the power plant.



43kW wave energy converter



Example of wave power generation