[JJ] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-CG Complex & General

[A-CG43]Coastal Ecosystems - 2. Coral reefs, seagrass and macroalgal beds, and mangroves

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Coastal marine ecosystems are complex open system interacting with surrounding watersheds, outer ocean, and the atmosphere, providing a wealth of various ecosystem services to human life. Simultaneously, they are also influenced strongly and often negatively by human activities. This session, together with a companion session dedicated for the water cycle and land-ocean interactions [A-CG##], aims to provide a platform for interdisciplinary discussion covering various aspects of frontiers in coastal ecosystem sciences. This session particularly focuses shallow-water benthic communities ranging from temperate to tropical regions, such as coral reefs, seagrass and macroalgal beds, tidal wetlands, and mangroves. All these communities are characterized by intrinsically high primary production, active material cycling, and biodiversity hot spots. However, increasing human demand for coastal marine resources and industrial development concentrating on coastal regions incur the risk of rapid degradation and diminishment. Comprehensive assessment and monitoring of ecosystem functions and development of effective means for conservation and restoration are urgently needed for such communities. This session is dedicated to organizing and promoting such research and management activities by sharing state-of-the-art science and technology among ecologists, geologists, geochemists, biogeographers, etc. Field-based observational, experimental, and modeling studies concerning the following topics are especially welcome: ecosystem functions; elemental cycling; community connectivity; environmental changes such as global warming, ocean acidification, and sea-level rise; ecosystem services such as carbon sequestration, nutrient regulation, and fisheries production; regional- or global-scale comparison; long-term ecological researches.

[ACG43-P04]Carbon cycle and net ecosystem production of a mature sub-tropical mangrove forest on Ishigaki Island

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Carbon (C) sequestration of a forest ecosystem is the biological process of removing CO_2 from the atmosphere and storing it in carbon pools, such as biomass and soil organic matter (SOM). Biometric based NEP (net ecosystem production) is described as the balance between net primary production (NPP) of autotrophs and respiration of heterotrophs (HR) in an ecosystem, and is conceptually equivalent to the rate of C sequestration in terrestrial ecosystems. Mangrove forests had a higher NEP compared to the other terrestrial forests, because of high NPP under tropical conditions and low HR due to anaerobic soil condition, and thus mangroves are well known for most C-rich ecosystems among the forests. For example, the NEP of

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Thailand’s mangroves was estimated to range from 7.3 to 11.3 t C ha^{-1} yr^{-1} (Poungparn et al. 2012), which is more than three times higher than the mean of temperate forests (2.5 t C ha^{-1} yr^{-1}, Kato &Tang 2008). However, the previous NEP estimates in mangroves did not consider the process of C fluxes with hydrological regimes. Thus, we conducted the study of C cycling not only using biometric method, but also including the dynamics of dissolved organic C (DOC) and inorganic C (DIC). The study was conducted in a sub-tropical mangrove forest of the Fukido River, Ishigaki Island, Okinawa, Japan (24°29′N, 124°13′E). The C pools and fluxes in the mangrove forest were estimated using a 0.64 ha permanent plot. The carbon pools in the permanent plot (164.6 t C ha^{-1} as aboveground biomass, and 261.5 t C ha^{-1} as SOM) were high despite the sub-tropical high latitude among mangroves. The aboveground NPP of the mangrove forest was 1.6 ± 0.15 t C ha^{-1} yr^{-1} as woody production, and 3.8 ± 0.28 t C ha^{-1} yr^{-1} as foliage production. Soil and water surface CO_2 efflux (as indicator of HR) in the permanent plot was continuously monitored using AOCC (automatic open-close chamber) method. The mean soil CO_2 efflux during low tide was 164 $mgCO_2$ m^{-2} h^{-1} (ranged from 84 to 392 $mgCO_2$ m^{-2} h^{-1}) which was lower than terrestrial forest ecosystems. The CO_2 efflux from soil surface during low tide was correlated significantly with exponential soil temperature. The mean water surface CO_2 efflux was 84 $mgCO_2$ m^{-2} h^{-1} (ranged from 7 to 353 $mgCO_2$ m^{-2} h^{-1}) during high tide using continuous chamber measurements in the field. DIC concentrations in the river mouth changed with tidal lever. During high tide, the concentration was the same as sea water level, however, the concentration was gradually increased during low tide. This indicated that the part of mangrove-derived CO2 from soil surface dissolved in the sea water as DIC, and were flow out to sea with tide. The trend of DOC concentrations in the river mouth was the same as DIC. Therefore, it seems inappropriate to apply biometric-based NEP to mangrove ecosystems. I will renovate the C cycle in mangroves including dissolved C fluxes such as DIC and DOC, and calculate NEP using biometric method with water flow model.

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