# Frequent observations of plastic forms in the Ariho River estuary, Honshu, Japan

Shunji Furukuma[1], Sonja M. Ehlers*†[2], and Julius A. Ellrich*[2]

[1]Independent Researcher (IR) – 409-24 Kiwanami, Ube City, Yamaguchi 7590207, Japan
[2]Department of Shelf Sea System Ecology, Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research (AWI) – Ostkaje 1118, 27498 Helgoland, Germany

**Abstract**

"Pyroplastics" and "plastiglomerates" are "plastic forms" (geochemically or -physically altered plastics) which have been found in marine coastal habitats worldwide. Both plastic forms derive from incomplete plastic combustion. While pyroplastics are burned plastics with a rock-like appearance, plastiglomerates are melted plastics fused with rocks (in-situ plastiglomerates) or in(organic) materials such as sand grains or wood pieces (clastic plastiglomerates). Surprisingly, information on pyroplastics and plastiglomerates in estuaries, that are considered plastic pollution hotspots, is limited to a pilot study for this study. Basic information on pyroplastic and plastiglomerate frequency of occurrence and abundance is missing, as is information on the potentially underlying environmental drivers. Therefore, we frequently surveyed stranded pyroplastics and plastiglomerates in the Ariho River estuary (Honshu, Japan) over seven months and studied all collected plastic forms using macro-, micro- and spectroscopic methods. Overall, 37 pyroplastics (consisting of polyethylene, polypropylene, polystyrene, alkyd resin, polyacrylate styrene and polyvinyl chloride) and seven plastiglomerates (consisting of polyethylene and polypropylene) occurred. Pyroplastics occurred frequently, while plastiglomerates occurred occasionally. Pyroplastic occurrence and abundance (items/$m^2$) were related to intertidal elevation since most pyroplastics floated in seawater. Strandline pyroplastic abundance, that contributed heavily to the overall pyroplastic and plastiglomerate abundance, increased under prevailing onshore winds indicating that such winds are environmental drivers of pyroplastic abundance. Floating tests showed, for the first time, that clastic plastiglomerates can float and, thus, constitute mobile pollutants. Macro-, micro- and spectroscopic examinations indicated only mild weathering of pyroplastics and plastiglomerates suggesting the regional and/or recent formation of both plastic forms. We also detected the first plastiglomerate with clastic and in-situ features (plastic containing (in)organic material firmly melted to a rock) which constituted a novel plastiglomerate variant that we termed "clastic/in-situ plastiglomerate". Overall, our study initiates the development of the fundamental understandings of pyroplastic and plastiglomerate dynamics and the underlying drivers in estuaries.

**Keywords:** plastiglomerate, pyroplastic, FTIR, environmental drivers, Seto Inland Sea

*Speaker
†Corresponding author: sonja.ehlers@awi.de