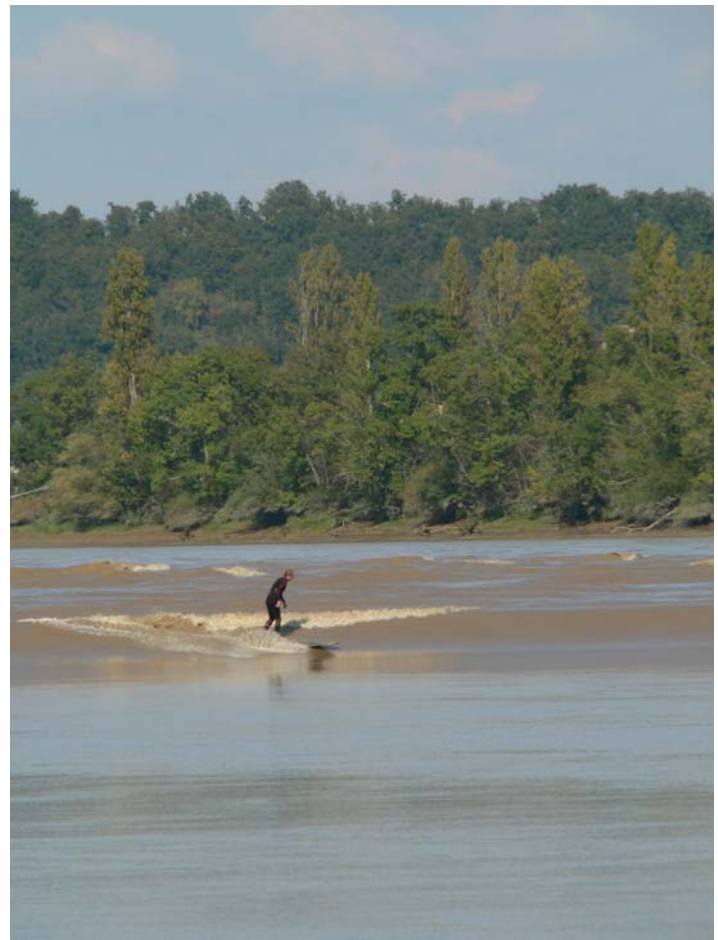


Three-Phase Flow at a Geophysical Scale: the Tidal Bore

- **Tidal bores form in the river mouth** when the tide turns to rising in a funnel-shaped estuary under spring tide conditions (tidal range greater than 5 to 6 m)
- **A tidal bore is a hydrodynamic shock** characterised by a discontinuity in terms of the free-surface elevation, and the velocity and pressure fields
- **Tidal bores have a massive impact on the estuarine zone** – a tidal bore is a ‘giant mixer’ that stirs bed material and advects upstream sediment materials – air is entrained in the bore roller and contributes to some re-oxygenation
- **Ecological impact** in terms of fish reproduction, spawning and fish egg dispersion in tidal bore affected estuaries were documented: Rokan River (Indonesia), Bay of Fundy (Canada)



Tidal bore of the Garonne River at Podensac (France) on 27 September 2008 at 16:51:38. Shutter speed: 1/800 s, f/3.7, ISO 80



Undular tidal bore of the Dordogne River at Port de Saint Pardon (France) on 2 September 2008 at 18:49. Fabrice Colas was surfing the bore front. Shutter speed: 1/800 s, f/4, ISO 80

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Tidal bore of the Sélune River in the Baie du Mont Saint Michel (France) at Roche Torin on 19 September 2008 at 09:30:25. Note the "wavy" transverse profile of the undular tidal bore caused by the river bathymetry and presence of shoals. Shutter speed: 1/800 s, Aperture: f/3.3, ISO 80.

Tidal bore of the Sée and Sélune Rivers just North of Pointe du Grouin du Sud (France) on 19 October 2008 at 08:40. The tidal bore surged into the Sée River channel (foreground) as well as over the sand bars (background) like a dam break wave with intense sediment scour. The white colour of the waters (foreground) gives some indication of the aeration and mixing processes. Shutter speed: 1/500 s, f/2.8, ISO 80