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Automatic Construction of Acoustic Themes for benthic habitat mapping at Stanton Banks, UK

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In recent years, many attempts have been made to develop automatic methods for segmentation of hydro-acoustic remote sensing data acquired by multibeam echosounders (MBES) in order to generate quantitative estimates of the spatial distribution of seafloor relief, bottom type and composition. The majority of the segmentation methods presented so far have been based on image processing techniques, which assume implicitly the existence of an image. This limits their ability to unambiguously discriminate seafloor properties, as the primary observation of an MBES is not backscatter imagery or mosaics, but rather backscatter angular response. Mosaics are only projections of the original observations, with resulting loss of information. The method we are developing is fully automatic and attempts to segment the acoustic remote sensing data simultaneously in the image-textural space and in the angular-response space. The output of this automatic procedure is a thematic map, where the individual themes have boundaries defined at the mosaic image resolution, but still have sufficient angular coverage to allow for seafloor characterization. Angular Range Analysis (ARA) inversion is then applied to the average angular response of individual themes, generating esti-

mates of the acoustic impedance, acoustic roughness and mean grain size of the seafloor within the theme. The technique described above is applied to a Simrad EM1002 95kHz MBES dataset acquired from a study area covering an offshore reef at Stanton Banks, UK. The results are compared to still-images, grab samples and previous habitat maps existent in the area, to assess the ability of the acoustic theme segmentation to discriminate benthic habitats.

References,

- McGonigle, C., Brown, C.J., Quinn, R. and Grabowski, J. (2009) Evaluation of image-based multibeam sonar backscatter classification for benthic habitat discrimination and mapping at Stanton Banks, UK. *Estuarine, Coastal and Shelf Science*. 81 (3): 423-437.
- Fonseca L., Brown C., Calder, B., Mayer, L., Rzhanov, Y., Angular range analysis of acoustic themes from Stanton Banks Ireland: A link between visual interpretation and multibeam echosounder angular signatures, *Applied Acoustics* (2008), doi:10.1016/j.apacoust.2008.09.008.

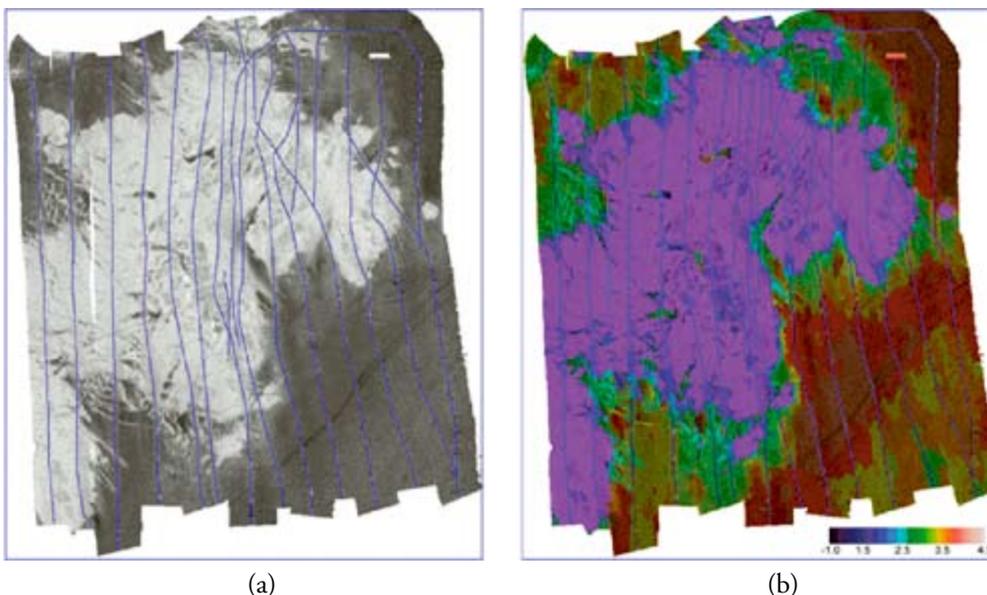


Fig. 1. (a) Adjusted acoustic backscatter mosaic (0.5m resolution). (b) Automatic segmentation showing the distribution of grain size (ϕ units).