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**Title:** *Argus*-Based Morphologic Response Test Bed Database

**Topic Area:** C7. Measuring and Monitoring Sediment Processes

**Objective:** The primary objective of this investigation is to exploit existing coastal image data sets to augment USAE coastal morphology response and coastal sediment transport computational model development. A secondary objective is to establish a data collection and analysis protocol that can be extended to inland environments.

**Benefits:** Exploitation and analysis of existing and available *Argus* data will provide the measures of coastal planform evolution not readily obtained by standard *in situ* methods in a variety of coastal settings that are ideal for the development and validation of the next generation of predictive models, particularly at *Argus* sites where nearby *in situ* measures of hydrodynamic parameters (e.g., waves and water levels) exist. The major benefit of this work unit is the quantification of the nearly continuous evolution shoreline and nearshore bathymetric features at natural scales and the population of a coastal morphodynamic computational model test-bed database that will be readily accessible to USAE personnel developing large-scale sediment transport and morphology evolution formulations for a variety of coastal settings including dissipative and reflective beaches, pocket beaches and shorelines adjacent to coastal inlets. This database is to be comprised of measurements of beach response at storm event, seasonal, yearly and possibly decadal time scales. From the information provided in a readily available and useful format, USAE investigators can derive/improve/validate analytical and numerical predictive tools for spatial and temporal scales that are of importance to the civil works mission and future operational RSM capabilities of the Corps. There is Field-support for use of the video-based technology in the coastal setting. For example, CESAJ recognizes the utility of the metric system. Through ERDC-CHL, CESAJ installed an *Argus* station in FY01 at Lake Worth Inlet, Florida to monitor shoreline evolution in support of a coastal inlet sand bypassing design investigation.

This work produces new tools and methods for the USACE and nation. It is an integral part of the Regional Sediment Management Research Program, and thus contributes primarily to support of the USACE's navigation, flood/storm damage reduction, and environmental protection and quality missions. It supports all 8 Civil Works strategic goals and 7 of 9 Listening Session objectives identified by HQUSACE as R&D priorities. With companion work units, it employs active technology transfer and insertion.

**Work Description:** The proposed work unit has two major components: (1) Extraction of spatial coordinates of morphologic parameters of interest from the international *Argus* data set and population of those parameters in a test-bed database suitable for use in computational model development and validation, and (2) evaluation of the data to provide and understanding of long-term (> 1-5yr) and short-term (storm event erosion and recovery) beach response time scales for shorelines spanning a broad range of coastal settings.

The work unit will be accomplished via a cooperative effort between ERDC-CHL, academia, and private consulting firms and members of the *Argus* consortium as required. Additionally, this work unit will be cost leveraged with other USAE and non-USAE research initiatives. Work will be coordinated with related USAE initiatives such as Coastal Inlets Research Program and other existing and future sediment management-related work units that will directly benefit from or provide guidance to this R&D effort.

A major product of this work unit will be a test-bed database for development and validation of coastal morphology predictive tools. Target end users of the database include ERDC researchers, USAE District personnel with advanced computational model development and execution skills, and others researchers collaborating with USAE model developers. This initiative will leverage off corporate software and database architecture/management strategies developed by other USAE programs. Oversight of database architecture development will be provided by ERDC investigators designated in the RSMP Informatics Task Area. For example, the work proposed herein will coordinate with RSM Work Unit entitled “Database Tools for Data Storage and Mining” and leverage off corporate technology/policy identified by that research initiative. Implementation support will be provided by ERDC-ITL and private consultancy as required. The database will be populated with highly resolved ((O) hr, (O) m) morphology response data and forcing parameters (where available). This component of the work unit will leverage off of the >\$3 Million invested (primarily by Office of Naval Research) in the development and implementation of the coastal image metric system. Morphology response measurements may be extracted from coastal image data obtained at as many as eleven *Argus* stations. Contractual support will be provided by academic student labor and *Argus* collaborators.

The second major product of this effort is to capitalize on the database population to quantify parameter space for evolution of coastal morphology features that span a range of spatial and temporal scales and coastal environments. This initiative will augment theoretical development of large-scale and complex coastal 2-D and 3-D planform behaviors such as non-linear pattern formation and self-organization in response to an aggregate of forcing functions.

It is anticipated that the work proposed herein will directly augment other RSM Work Units under the “Measuring and Monitoring Sediment Processes” Task Area. These work units include “Measuring and Monitoring at Local Scales” and “Methods and Approaches for Measuring and Monitoring Sediment Processes at Large Scales”). Information regarding the application of video metric systems (i.e., *Argus*) for coastal and inland RSM monitoring applications will be directly transferred to companion work units.

## **Products and Schedule**

The primary products of this work are a testbed database for use in processes and solutions work units and knowledge of coastal morphology processes that can be used in subsequent work.

<u>Product</u>	<u>Scheduled</u>
1. TN: Data Extraction Theory/Methodology/Algorithms	04Q/02
2. TN: Database Architecture	04Q/02
3. Apply Algorithms to Existing <i>Argus</i> Data Sets	02Q/03
4. Assess Accuracy & Error of Methods	03Q/03
5. TR: Objective/Method/Validation	03Q/03
6. JP: Objective/Method/Validation	04Q/03
7. Test-Bed Database Population/On-Line	01Q/04
8. TN: Parameter Space Analysis	02Q/04
9. TR: Parameter Space Analysis	03Q/04
10. JP: Parameter Space Analysis	04Q/04