Incorporation of a Nearshore Hydrodynamic Model into the Unmanned Cooperative Cueing and Intervention Automated Planner

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Award Number: N00014-09-1-1036
http://ceprofs.civil.tamu.edu/jkaihatu/research/proj.html

LONG-TERM GOALS

The overall goal for this project is to incorporate the Delft3D hydrodynamic model suite into the Unmanned Cooperative Cueing and Intervention Automated Planner (UCCI). This would allow the UUV system to incorporate real-time information into its routing, and also allow for possible feedback between the modeling system and the UUV system.

OBJECTIVES

1) Set up Delft3D for an area of operational importance.
2) Develop connectivity between the model and the UCCI planning tool.
3) Develop methods for calculating bottom ripple properties from Delft3D output.
4) Automate the system

APPROACH

A set of run scripts for automated Delft3D operation had been developed previously by teams at both the Naval Research Laboratory and Texas A&M University. These scripts must be altered in order to accommodate the needs of this project. The Delft3D model must then be set up for an area of operational importance; during discussions with Metron (developer of the UCCI tool) both Coronado, CA and San Clemente Island, CA were mentioned as acceptable candidate locations. The output of Delft3D needs to be converted to an XML file for the UCCI planner to use the information. Finally, results of the Ripples DRI are to be used to help convert Delft3D bottom velocities to ripple properties.

WORK COMPLETED

We have attempted to fix the model blowup problems we have seen with Delft3D for San Clemente Island. What had at first appeared to be due to insufficiently resolved bathymetry was instead due to instability along the boundaries. While we have attempted to fix this in various ways, accurate information along the boundaries is the clearest path toward fixing these problems at this scale.

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
30 SEP 2011		**00-00-2011 to 00-00-2011**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Incorporation of a Nearshore Hydrodynamic Model into the Unmanned Cooperative Cueing and Intervention Automated Planner	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Texas A&M University,Zachry Department of Civil Engineering,3136 TAMU,College Station,TX,77843-3136**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**3**	

RESULTS

Figure 1 shows the progression of information at a boundary becoming progressively unstable. Close inspection of the bathymetry in the area shows that there are no egregious irregularities, and that the instability is clearly a boundary issue.

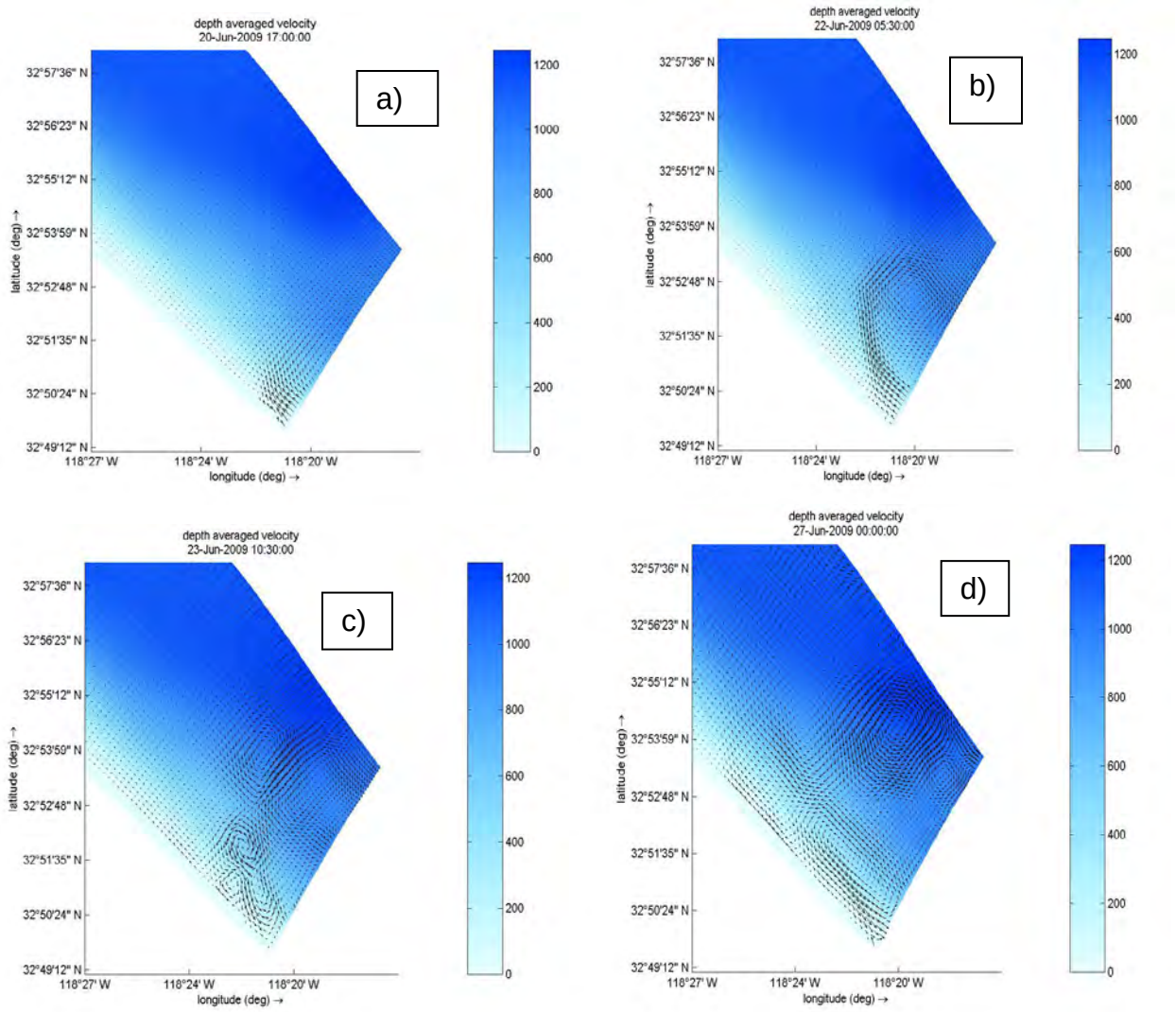

Figure 1: Evolution of a boundary instability: vectors of depth averaged currents. Time progresses from a) to d), at which point the simulation becomes completely unstable.

As with last year, several concerns have become evident during the course of this work. First of all, the output of Delft3D is in a proprietary format; the QUICKPLOT software embedded within Delft3D is required to decode the output. This would make conversion of the output to XML problematic without the Delft3D software. Another concern was the connection between the model and the UCCI planner

in terms of where each system resides (secure environment vs. non-secure). We are moving on in the meantime to incorporate information on ripple orientations based on Delft3D simulations.

IMPACT/APPLICATIONS

Once these concerns have been worked through, the completed system will represent a major advance in coupling physically-realistic models with real-time data streams.