

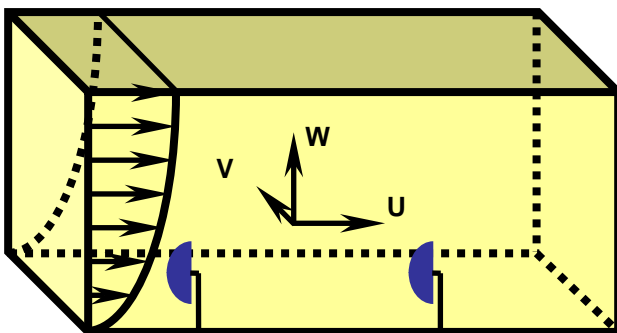
Editor's Corner

Progress on the EU project

The six months report for the European Project ENDOW (Efficient Development of Offshore Windfarms) has been submitted to the Commission. Offshore wind energy developments are underway in many European countries with planned projects of several thousand megawatts to be installed in the first decade of the new millennium. While experience gained through the demonstration projects currently operating is valuable, a major uncertainty in estimating power production lies in the prediction of the dynamic links between the atmosphere and wind turbines.

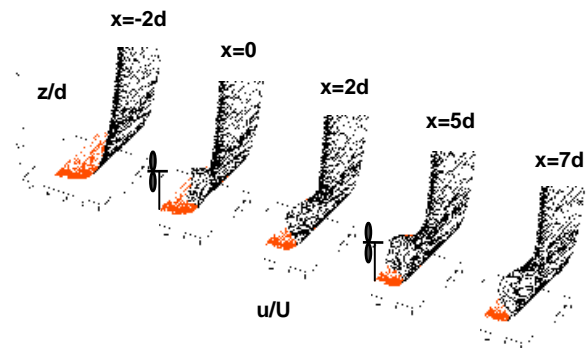
The objective of the ENDOW project is to evaluate, enhance and interface wake and boundary-layer models for utilisation offshore. This will result in a significant advance in the state of the art in both wake and marine boundary layer models leading to improved prediction of wind speed and turbulence profiles within large offshore wind farms. Use of new databases from existing offshore wind farms will provide a unique opportunity to undertake the first comprehensive evaluation of offshore wake model performances. The wake models to be evaluated vary in complexity from empirical solutions to the most advanced models based on solutions of the Navier-Stokes equations using eddy viscosity or k-epsilon turbulence closure. Results of wake model performance in different wind speed, stability and roughness conditions will provide criteria for their improvement.

We have already made some initial simulations using 3D Navier-Stokes calculations. Initial data required to start the numerical scheme are the velocity and turbulence intensity profiles in the atmospheric boundary layer upstream the rotor (ambient atmospheric conditions). Those data are strongly dependent on the atmospheric stability parameters. The computational domain includes the rotor of the wind turbine(s).



The rotor area at the moment is approximated by means of a semi-permeable disk to simulate the pressure drop across a real rotor disk (thrust).

Indicative numerical results of the 3D N-S model are given in the sequel for a double wake development in neutral atmospheric conditions with 10m/s wind speed at hub height (=40m) and 5% ambient turbulence intensity. A thrust coefficient of 0.75 was used for both machines. The following Figure presents axial velocity profiles.



Based on experimental data from offshore wind farms in operation, the next six months 3D N-S will be evaluated and tuned and then will be used as basis to tune simpler and faster versions (modules) to be implemented in an Offshore Wind Farm Design Tool. In parallel, since the thrust curve of the wind turbine is not usually available, RGU will attempt to couple 3D N-S with a simple blade element model to account for both the axial and the tangential load distributions along the span of the rotor blades.

Applications of the improved 3D N-S model will be used to produce simple parametric expressions for the velocity, turbulence intensity and length scales in the far wake as well as in multiple wake situations. Those expressions will be included as modules in the wind farm code.

Looking forward to more exciting CFD simulations in the near future ...

Kostas Rados
Convenor

***"Slice of Ocean Test Facility"
Now Working***

At last the wave tank is working properly. It has taken many months but the "Slice" is now delivering beautiful large waves. This tank is easily the largest of its kind in Scotland and gives a clear signal to the outside world that we are a major presence when it comes to hydrodynamics. Hopefully we will have a fully-fledged LDV system next year, if we can persuade someone to pay for it!



The Slice of Ocean Test Facility in action

The Pentland Firth

Following on from some major publicity for our tidal current research in the Press and Journal, the Sunday Times and the Mail on Sunday, Kostas and I have submitted another major research grant application to the EPSRC. This proposal entitled "Tidal Current Resource Assessment, Associated Parametric Design and Implementation Plan for the Pentland Firth (RNET3/204)" is currently being peer reviewed and we should hear the results within two months. "Fingers Crossed Folks"

Research Elevation

The Dean has asked me to be research co-ordinator for the Faculty of Science and Technology. This important position will allow me to influence the direction of research across the Faculty and produce a coherent structure to all of the research in the three new Schools. Joining me on the faculty research committee are Douglas and Kostas as well as representatives from The School of Applied Science and the new School of Computing.

Ian Bryden



Wood Group Lectureship

My post has now been made official - the press release was included in last Thursdays' (21.09.00) Business section of the P&J. The original copy (which will be included in the Wood Group News and their Web-site) reads as follows:

Wood Group has partnered with The Robert Gordon University in Aberdeen to fund a new three-year post. Since April, Dr. Stephanie Rigby has been working in the role of Wood Group Lecturer in Environmental Engineering at the University. "During her first year Stephanie will primarily carry out work for Wood Group on a range of Environmental projects, enhancing WG's environmental capability", says Bill Edgar, chairman and chief executive, WGE. "Her role in this post will help to cultivate an excellent interface between Wood Group, the industry and academia, as well as developing an improved teaching and research profile relevant to the needs of industry."

The knowledge and experience gained by Stephanie will also be used to develop the environmental training courses at Wood Group and will also help to enhance the new degree course in Environmental Engineering at RGU.

Basically, I'm tasked with helping WG to ID their enviro. training needs in accord with any EMS, which is developed and implemented over the next three years. I am aiming to provide General Awareness Training to all employees over the next 9 months, probably (or should I say hopefully!) with the help of Peter. I'll also get involved with the Enviro. Aspects Evaluation exercise which will underpin their EMS and provide a framework for the Groups' environmental objectives and targets.

I recently passed the IEMA approved "EMS Internal Auditors Course" which enables me to train engineers in industry w.r.t. the enviro. aspects and impacts of their business operations, EIA, EMS and Enviro. Auditing etc. (i.e. some of their specialised skills training).

I'm also acting on/with a number of relevant committees, workgroups etc. including the Grampian Business Forum (by invitation) and the WGE2000 Steering Groups for "Diversification" and "Environment".

At the same time, of course, we're all gearing up for the Enviro. Engineering Degree Validation (scheduled for later this calendar year), the development of the Enviro. Research Lab. and Environment & Energy Centre, which will be the subject of other FERG articles and future Bulletins.

Steph Rigby



Ever Increasing Circles

Much has happened in the time since the last Bulletin, away back in May. FERG has expanded in numbers with the arrival of Peter Robertson, Atholl Campbell, Angus MacLeod and Chris Heide. C517 is getting really quite busy. As usual, the topics covered in the monthly meetings were wide ranging. From Sarah Dacre's 'Rough Guide to her PhD (environmental modelling of tidal turbines)', through Steve Nas's 'Trials and Tribulations of Underbalanced Drilling' to Phil McCurdy's heavy crude analysis. We look forward to more exciting talks in the new semester. Regretfully, the programme of coming talks has not been compiled, so I am unable to wet your appetites. However, this is your chance. If anyone wants to talk about his or her research to get ideas, guidance or presentation practice, please contact Kostas or myself?

The audience of this newsletter has also expanded. In addition to the Deans of Faculty, some Heads of School and Academic Affairs, the last issue was also sent to the University Board of Governors. The publication was well received.

Library News: Please remember that the FERG library is for the use of all FERG members, so please return books once you have referred to them? If you know of any books, which you think are of use to the library, speak to Ian about buying them. The library now includes the ISOPE 2000 proceedings covering all aspects of offshore and coastal engineering (including three papers from FERG members).

Tidal Power Optimised!

The OPT-Current project was two years old in July. Work has been going well. The economic optimisation model is now running and producing reasonable results. The code is undergoing some renovation after recent discussions with the project partners. The hydrodynamic model is under continuing development for smooth running and the incorporation of the Arklow Bank data. The model of the Straits of Messina (Italy) is under construction in preparation for comparison with field survey results.

An abstract on the OPT-Current optimisation procedure was accepted for the ISOPE conference in Stavanger next year. The paper will cover the application to the Arklow Bank area.

**Guy T Melville
Vice-Convenor**



News from Sarah

Believe it or not I have been here now for about 7 months.....7 months!! Where does time go!!! I have experienced the latter part of a Scottish winter and a Scottish summer and can I tell the difference?! Well, apart from longer days in the summer and a few rays of sunshine, probably not!!!

Despite my yearnings for sun, my research has been going reasonably okay.....a few slack moments, but as whole okay. I have lost count how many papers and books I have read. Of course some were more interesting than others, but all in all I guess I have broadened my knowledge of the subjects within the project. At present I am close in initially completing objective 1 of my project, with the development of a conceptual diagram illustrating the environmental impacts of tidal current energy. An Environmental Impact Index (EII) has also been developed. The aim of which is to provide a tool to identify the environmental constituents most at risk in a semi-quantitative way. Work is soon to start on the modelling aspect of my project. It is hoped that shortly a model showing the flow disruption in a channel due to tidal current devices will be completed. This is the 'key' to assessing other impacts tidal current devices may have.

Abstracts have been completed for Marine Science 2000, Dunstaffnage Marine Laboratory, Oban (Nov) and the ECOSUD conference in June 2001. The MAREC 2001 abstract will soon be on its way.

Aberdeen Techfest 2000 was an all round good experience.....though I must admit I now know the reasons why I didn't go into school teaching!!! My patience was somewhat tested at times!!! I also got the opportunity to handle a Tarantula, which was a little daunting, but I felt mighty proud of myself!!

As a side note, I have recently started classes in the Greek language.....so Kostas beware of unintelligible ramblings!!!

Until the next time.

Sarah Dacre



Greetings Everyone,

I'm sure most of you have met me over the course of the past three and a half months (I'm the bloke in C517 reading SPE papers ad infinitum!). My PhD research (overseen by Babs) has began with a mass of reading and its working title, 'Hole Cleaning Analysis for Underbalanced Drilling Operations', is a subject which I was largely unfamiliar with not so long ago, but my databank of knowledge is ever expanding. My undergraduate background of Geology/Petroleum Geology has stood me in good stead with respect to the reservoir side of Underbalanced Drilling, but I've had to make up some ground when dealing with the well engineering aspects of the research. A course of PgD lectures which I am attending continues to furnish me with the relevant information. Nevertheless, I have found what I have learnt so far very interesting and I look forward to making a tangible contribution to this ever expanding field of research. On a lighter note, I continue to find it amusingly ironic that I share my office with Sarah and Guy (among others), who are both working hard towards forms of environmentally friendly renewable energy, whilst I'm here with the 'let's pump the well dry' approach! Despite this disparity in our ultimate research goals, we get on just fine and civil war doesn't look likely to break out!

Atholl Campbell



CFD stories ...

I'm sure I've now met most of you since I joined FERG a few months ago, but if I haven't then I'm working as research assistant for Kostas on CFD prediction of tidal turbine wakes. I graduated from the BEng MOE course at RGU shortly after starting here, my previous CFD experience being my honours project which was on the flow patterns over multiple parallel pipes on the seabed using CFX.

Using CFX was a fairly painful experience, and I was glad to find that we've switched to Fluent (which doesn't seem quite as unpredictable) as our commercial CFD package. Having finally undergone the introductory training course in Fluent I have much less excuse for getting "stuck", although it does mean that their technical support staff will at least now speak to us!

A satisfactory model of the flow domain for use with Fluent has been created and meshed, which is one major step forward, as was our getting the "fan" boundary condition to work (which had baffled even the technical support officer who gave our introductory training!) All that remains now is to make the stubborn thing actually converge!

Fortunately work using our in-house program, 3D-NS, has been more successful, and some convergent solutions have been obtained.

Angus Macleod



News from Douglas

My main work over the past few months has been on trying to develop the Engineering Network: UK Drilling and Production, since the award came from EPSRC. The difficulty is that there is much activity in the industry and the active personnel are 'on the move'. Meetings are difficult to set up and people are difficult to see. However, on the electronic side it looks like I may be able to team up with Computing and Maths, and Information and Media Studies to develop an electronic Network exclusive to the industry and supporting the theme of technology transfer from previously untapped academic sources, as well as existing ones.

Douglas Morrison



This document was created with Win2PDF available at <http://www.daneprairie.com>.
The unregistered version of Win2PDF is for evaluation or non-commercial use only.