



FERG NEWSLETTER



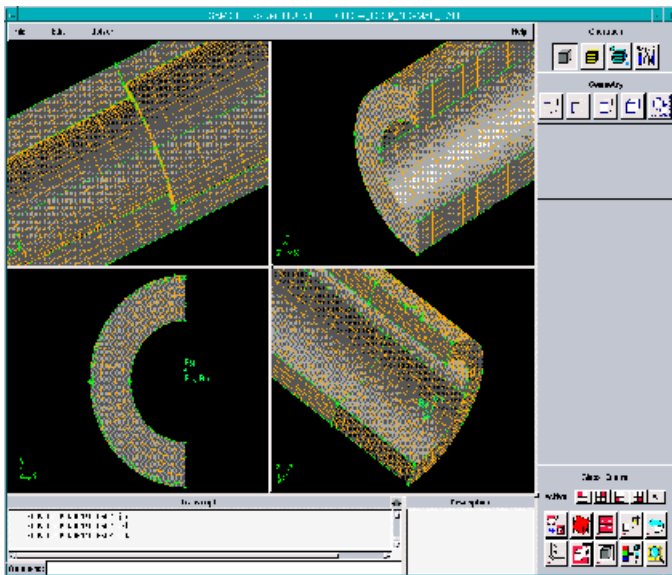
Fluids and Environmental Research Group

December 2001

Editors Corner

It's hard to believe that we are at the end of another year, with the thought of Christmas and New Year bearing down on us already!

This month's FERG newsletter contains some exciting news on the renewable energy front, with Ian and Guy positively YELLing for joy (more puns later!). Kostas gives us the lowdown on what he's up to in Sunny CA and AJ Macleod gives us a CFD update in addition to some tales of SUN woe! We also have news of an interesting environmental module and an environmental engineering degree awareness event from Steph, as well as a FERG newbie, Mohamed Amish making his debut. Sarah gives us an update on her Pentland Firth activities over the last few months and we wrap up proceedings with the forthcoming FERG events diary.



GAMBIT screen showing half annulus with varying annular clearances

2001, for me anyway, has flown by, and at the blink of an eyelid I'm a year and a half into my research project entitled: "Hole Cleaning Analysis for Underbalanced Drilling Operations". The project involves the CFD modelling (using the FLUENT solver) of two-phase flow through annuli, examples of which can be seen above. You'll notice that the geometry has been split in half in order to reduce

computation time, which can easily be in the order of weeks! The annulus I have modelled is scaled to match the dimensions of one of the flow loops downstairs in the labs. This will enable me to attempt to replicate the data of one of the MSc (Oil and Gas Engineering) students, who did some two-phase flow experiments earlier this year.

Unfortunately, the modelling has been hampered of late by the untimely demise of the SUN servers main hard disk (a post-mortem of which can be seen in A J MacLeod's article later on...)

Despite the cessation of SUN activity, I have nevertheless kept myself busy, examining the mechanistic side of two-phase flow modelling in order to put in place a rigid validatory model to compare with the data of the flow loop and FLUENT.

Best wishes to all FERGies for a happy Christmas and a fantastic New Year!

Atholl M Campbell
Editor

Yell for Energy

Things have almost moved on from OPT-Current. My focus has moved to a short-term research project funded by the DTI and the Engineering Business. My part in the project is to carry out hydrographic modelling of Yell Sound in Shetland. The model is progressing steadily with some reasonable order-of-magnitude results.

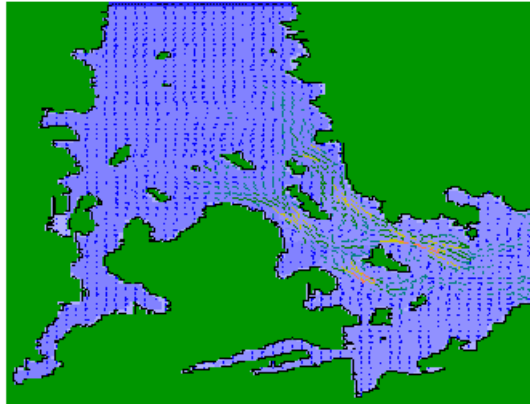
The overall goal of the project is to use the hydrodynamic data to find a suitable site for placing a prototype tidal current energy device. Hopefully, I'll get a trip to Shetland out of it as well.

In the new year, Ian should land the second part of the Pentland Firth project - more modelling and a trip to Orkney.



RGU Tidal Simulation

25:05:00



Convenor News

Time seems to have flown since September. We have had a number of meetings, but only one presentation. Mohamed gave a talk last month on his PhD. work on formation damage. The talk was well received and I am sure he took away some pointers to his future direction with the work.

In the absence of speakers, we have had some useful discussions on the future of FERG. Members have been asked to put together lists of possible speakers and subject matter so that we can get more external speakers for the coming months. The idea of having set discussion topics has also been suggested. So, we will try this out during the next year.

We have formed an informal relationship with the Materials Research Group. The idea is to work together to obtain resources from the School in order to fund the library and visits from external speakers. Discussions have been held, but neither myself nor Asher has got down to writing the funding proposal yet.

We have some speakers lined up for next term including Edward's research assistant, Susie Olsen. Details are given in the Forthcoming Events section.

Have an exceptional festive season.

Guy T Melville
Convenor

Not so quiet on the tidal front...

The activities of the Tidal Power Research Group

continue. Guy, Sarah and Angus are all working eagerly towards meeting the World's energy needs for the 21st century and beyond. Guy assures me that the final report of the OptCurrent project is all ready to wing its way towards Brussels any day now.

We are eagerly awaiting approval from Scottish Enterprise Ltd for the second stage of the Pentland Firth project, once they've digested the weighty tome we delivered for stage one that is. Verbally we have been told they are very happy with the document and that we should get confirmation of the second and third stages shortly.

I am currently involved in preparing a suite of linked projects for the EPSRC "Supergen" initiative, which is aimed at promoting the development of renewable energy in the UK. Similarly I expect that we will also submit a Framework 5 project "Tidal EDDIES" to the Commission in conjunction with our old friends at University College Cork.

We have landed an exciting contract with the DTI to write the scope for their new tidal power research programme. This is almost unbelievably exciting as it recognises that the RGU is seen by the Government as the only institution which they trust to shape the future of research in this field. Such a contract has never been granted to a UK University before! In parallel with this, we have landed a contract research project with the Engineering Business Ltd. to assess the feasibility of extracting tidal current energy from Yell Sound in Shetland. As part of this, Guy and I will be participating in a marine survey in Shetland in January (AAAAAGGGGHHHH!), still it may coincide with Up Helly Ah!

Ian Bryden

News from across the pond

Hello everybody,

I am still in the Naval Postgraduate School although time flies very quickly – nine months already. Missing you all!

Just a few words to update on the progress of my project here. I am working on a mesoscale atmosphere model called "Coupled Ocean and Atmosphere Prediction System" (COAMPS) developed by the Naval Research Laboratory of the US. COAMPS is a three-dimensional non-hydrostatic model and has been used for operational forecasting since 1996 and also for a wide range of research purposes for both idealized as well as real data



simulations. The research project aims at the evaluation of surface flux and boundary layer parameterizations used in that model, for the marine atmospheric boundary layer development. A paper with some preliminary results compared with aircraft observations has already been presented in a mesoscale processes conference in Florida last August. Those results pointed to further in-depth inter-comparisons between the model and the observations for budget analysis on the mean and the boundary layer height and further study on grid resolution and how it may affect the predicted flux transfer at the air-sea interface. I am currently working on this and hopefully get one journal paper done within the next couple of months.

COAMPS is provided free for research purposes and can be used for wind energy applications as well as for weather prediction. For example, wind measurements covering a large offshore area for prospective wind farm installation are expensive and difficult to conduct. For those areas, atmospheric mesoscale numerical models with the appropriate spatial resolution can be applied instead to predict the spatial and temporal variations of the wind speed and turbulent kinetic energy. There are a number of potential projects to be considered in this new research field under the next European framework programme.

Best wishes to all for Christmas and New Year.

Kostas

SUN Crash Shocker

A very short update this time round..... Asher and I have spent the best part of the last month rebuilding from scratch the SUN network which so much of the research in this department relies on. Our venerable server's main hard disk finally gave up the ghost in a rather complete manner having bravely suffered the tropical climate of the Sun room for several years.

Whatever moron in the upper echelons thought they'd save pennies by fitting recirculating fans in the SUN room instead of extractors or better, air conditioning, should have a think about the fact that the facilities that so many tens of thousands of pounds worth of research depends on have been unavailable for almost a month, vital research results have been lost and considerable staff time has been wasted - hardly a saving on any terms!

On the "Optimisation of Tidal Farms" project, our partners at Strathclyde University have finally decided that they're going to run their experiments in Malaysia, rather than the Denny water tank in Glasgow. Unfortunately, the number of runs they'll be able to do is much reduced and time is getting short, but it's good we should have something to compare our CFD results with eventually.

We also have a new version of 3D-NS that is capable of simulating multiple turbines in various configurations, so hopefully I'll be putting that through it's paces over the next few weeks having finally got the SUN network to the point where it can be left to largely look after itself.

AJ MacLeod

Greetings from Mohamed

Hi everyone
 Christmas Greetings and best wishes for a happy New Year. My research area is analysis of drilling fluids filtration with relation to formation damage in high-pressure high temperature wells. I have done so far three presentations in October/November 2001 to M-I CO. and FERG. Interesting comments and feedback has been received from colleagues and the next plan for me is to give my proposed papers for publication to FERG members for comments. Best wishes for all research students!

M.Amish (Ph.D.)

Environment Matters

Hi folks,
 Well it's been a hectic semester all round, with teaching commitments being a high priority. Of course as one Semester winds down, my thoughts are turning to preparation for Semester 2. I'm working with Peter (Robertson) on the development of a new stand-alone module in Environmental Impact Assessment / Management. In light of both the regulatory imperative *and* relevance to a wide range of disciplines, we are expecting this to be a popular choice.

Our proposed TCS programme for development of a hybrid power system will hopefully get off the ground in the New Year - supported by other fuel cell



projects happening within the School.

There are plans afoot to organise a combined "event" in the New Year for raising awareness of both the Environmental Engineering degree course and the new research projects - hopefully with involvement from ReGenTec, Scottish Enterprise and others. Watch this space.....!

On the Wood Group front, I'm working on a paper at the moment with Sam Long, the WG corporate Environmental Advisor, to help support future EMS developments within the organisation.

Here's wishing everyone a very happy and peaceful Christmas and New Year. See you all in 2002.

Steph Rigby

Further Research

I really can't believe its time for another FERG article.....where does the time disappear too? Obviously just having too much fun!!

The Pentland Firth, phase 1 report is now finished and quite a substantial piece of work that was if I don't say so myself (only a couple of thousand words short of a PhD thesis!!) - a few arms have been stretched carrying that one around in recent weeks.

From the project a number of interesting conclusions and recommendations have been made. The Pentland Firth with its phenomenally strong tidal currents is in no doubt a prime location for Tidal Current Energy, with electricity generation providing in the region of 1 TW hour per annum. A number of technical constraints and technical problems were highlighted including navigational and shipping implications and other constraints associated with depth and high water velocity etc. The main environmental impacts highlighted included seabed disturbance, disturbance of seabirds and mammals both visually, physically and auditory, possible changes in tidal patterns and wave climate and water quality. Socio-economic impacts included potential problems associated with existing traffic patterns, navigational difficulties and loss of access. Overall, there were also a number of benefits discussed, which ranged from an efficient and reliable energy resource with no emissions to the direct creation of job opportunities and the potential for diversification in the oil, gas and shipping industries in the local area and Scotland as a whole.

It was concluded that the magnitude of such impacts and constraints could be low if mitigation procedures were applied and further environmental issues were investigated. All in all, the report has highlighted that it is a common misconception that renewable energies are without their environmental detriments. However, there is no doubt with adequate research in such issues these uncertainties will be resolved in time. It is thought that such impacts will be within the scope of 'natural variability', but if not, it is hoped that research will provide adequate mitigation through design and environmental prediction and modelling. The project discussed a number of further research opportunities, with the view to establishing a monitoring program to establish performance and environmental characteristics.

An opportunity has recently arisen to establish just that with the view to further research into the environmental impacts of tidal current energy, closing the gap in the limited knowledge that already exists in this area.

The DTI have commissioned a study to establish a work programme to quantify key potential environmental impacts. This scoping study will endeavor to identify the principal interactions between tidal energy extraction and the environment, the consequence models for such interactions and the measurables by which such impacts maybe quantified. This will aid in the establishment of a programme of work assessing the state of the environment before and after the installation of technology. It is hoped that the scoping project will provide a means for further work in this area using the prototype being installed off the Lynmouth coast in Devon next year.

I just want to take this opportunity to wish everyone a great Christmas and a prosperous, happy New Year!!

Until next time.

Sarah Dacre

Forthcoming Events Diary

24 January 2002 - Presentation by Terry Rhode from Shell Consultancy Services. Topic: 'Transfer of offshore engineering technology to offshore wind power technology'



Forthcoming Events Diary (continued):

20 February 2002 - Presentation by Bob Bradly
from Biological Sciences (provisional)

13 March 2002 - Deadline for March Newsletter

20 March 2002 - AGM (Presentation by Susanne
Olsen)

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