AuScope

ARCS Compute Grid Supporting Research Community Development: the Underworld Case Study

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Overview

As part of **AuScope SAM Victoria**'s
user engagement strategy,
an **Underworld** job submission template
developed for the Grid submission client **Grisu**
allows novice users of Underworld,
with **no prior experience with
compute clusters or Linux command-line**,
to easily & quickly submit
Underworld compute jobs to a cluster
across the **ARCS Compute Grid**.

What is Underworld?
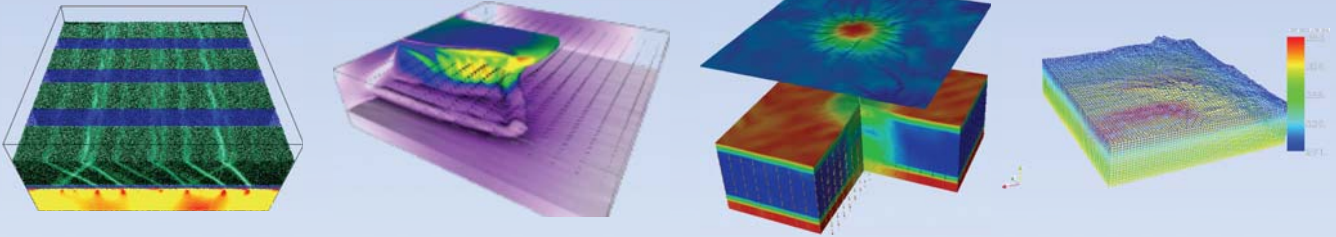
- 3D parallel finite element modelling code & framework
- particularly well suited to long time scale geological processes such as mantle convection, lithosphere extension & tectonic plate subduction
- includes gLucifer visualization toolkit
  - both interactive (local) & background (remote) rendering
  - enables user to monitor real-time progress of model run

What is Underworld?
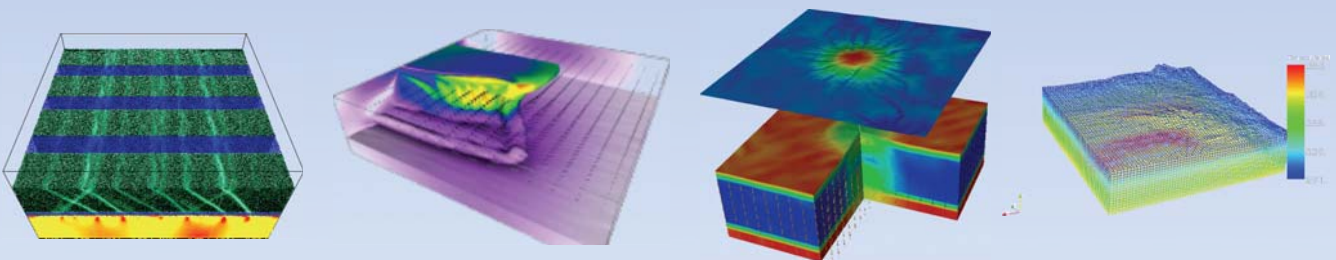
- under collaborative development by Monash University & the Victorian Partnership for Advanced Computing (VPAC), as part of the Victorian node of the NCRIS AuScope 'Simulation, Analysis, Modelling' capability (AuScope SAM Vic)

www.auscope.monash.edu.au

Underworld Support

- AuScope SAM Vic provides assistance to researchers, in adapting Underworld template models to their own research questions, on an individual & / or research group basis

- online user documentation, also frozen at each release:
  - instructions for installation, using on clusters & ARCS Grid
  - Underworld User Manual, including model cookbook being expanded into online tutorials
  - Component Codex

- release code made available in a variety of forms for users of different operating environments & technical skill-sets

www.underworldproject.org

Underworld Releases

	Compiled	Usage	Experience Required	
Source code	✗	local machine or cluster	Advanced	
Binaries	✓	local machine only	Linux command-line	
Release modules on HPC facilities	✓	cluster via ssh login	Linux command-line	
		cluster via ARCS Grid	Anyone who doesn't want to deal with command-line or job submission scripts	
			Novice	

Underworld Release Modules

- pre-installed copies of Underworld at PfC (NCI National Facility & ARCS) HPC facilities

  - Victorian Partnership for Advanced Computing (VPAC) *
  - iVEC, The hub of advanced computing in Western Australia *
  - NCI National Facility
  - Monash Sun Grid *

- more to come with the next public Underworld release ...
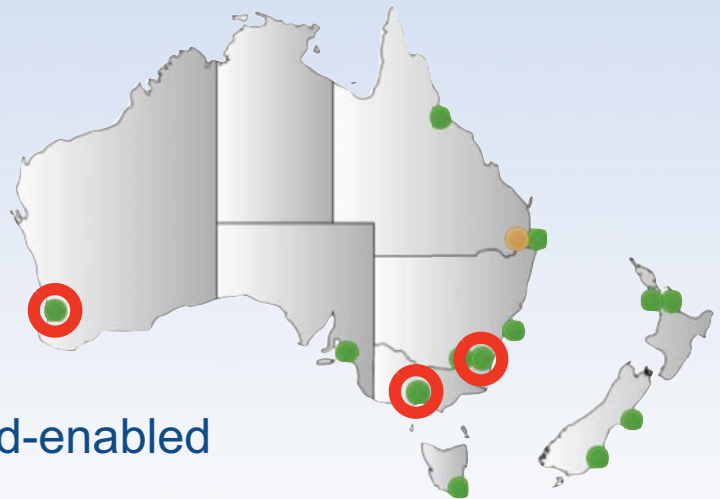
  * Grid-enabled

Underworld Release Modules

- Module details are entered into the NCI National Facility Software Map (nf.nci.org.au/facilities/software/)

Location	Details about System	Version	Default (Suggested)	More Details	Notes	Installed
NCI National Facility @ ANU	xe.nci.org.au	1.2.0	✓		How to Use	
iVEC / WA	cognac.ivec.org	1.2.0		✓	How to Use	
		1.1.0			How to Use	
VPAC / Vic	tango.vpac.org	1.2.0		✓	How to Use	
		1.1.0			How to Use	
Monash University	hn3.its.monash.edu.au	1.2.0		✓	How to Use	
		1.1.0			How to Use	

Underworld Release Modules

- Information in the Software Map is then published to the Monitoring & Discovery Service (webmds.arcs.org.au/), for interrogation by Grid clients, such as Grisu

Site: hn3.its.monash.edu.au

Name:	Monash
Description:	Monash University
User Support Contact:	philip.chan@its.monash.edu.au
Sys Admin Contact:	philip.chan@its.monash.edu.au
Security Contact:	philip.chan@its.monash.edu.au
Location:	Victoria, Australia
Web:	http://www.monash.edu.au

Software Resources

ClusterUniqueID: SunGrid	ClusterName: Monash_Sun_Grid

SubCluster: hn3.its.monash.edu.au	SubClusterName: hn3.its.monash.edu.au

Show/Hide Software Information +/−

SoftwarePackage LocalID: Underworld/1.2.0

Name	Version	Module
Underworld	1.2.0	underworld/1.2.0

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What is Grisu?

arcs Australian Research Collaboration Service

- Grid submission client being developed by ARCS
- enables users to submit remote compute jobs to a range of HPC facilities on the ARCS Grid, using a Graphical User Interface
- formally released at the end of April 2009 (ver. 0.2)
- Grisu releases are coordinated by the Grid User Services Steering (GUSS) Group
- incorporates a customised job submission template for Underworld (as well as other supported codes)

www.arcs.org.au >> "Compute Jobs"

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Grisu Login

- Shibboleth (SLCS)
- Standard (Grid Certificate)
- MyProxy

Underworld Template

- custom Underworld job submission template
- developed by ARCS in conjunction with AuScope SAM Vic

Grisu client

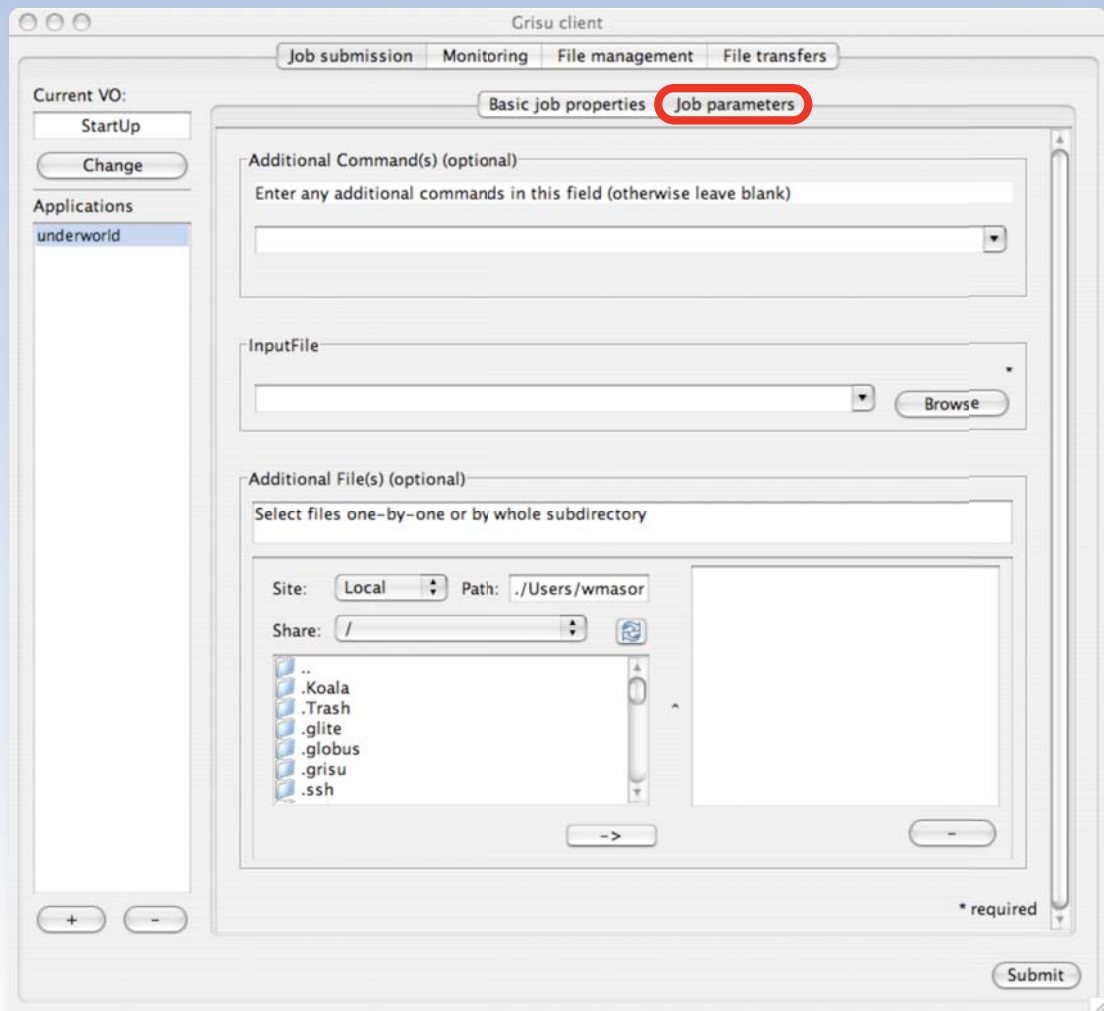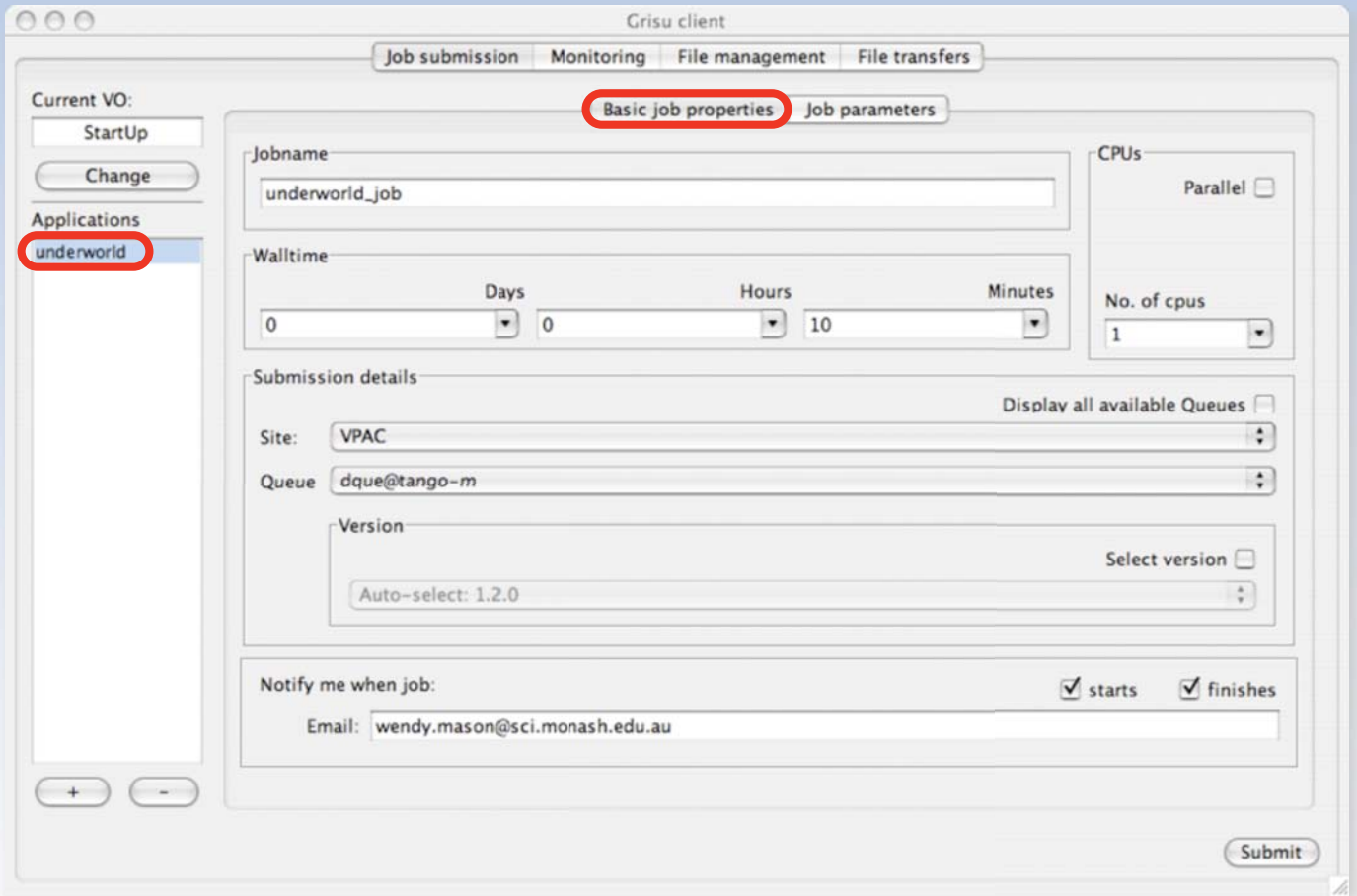Job submission Monitoring File management File transfers

Basic job properties Job parameters

Current VO:
StartUp

Change

Applications
underworld

Jobname
underworld_job

CPUs
Parallel ☐

Walltime

Days Hours Minutes
0 0 10

No. of cpus
1

Submission details

Display all available Queues ☐

Site: VPAC

Queue dque@tango-m

Version

Select version ☐

Auto-select: 1.2.0

Notify me when job: ☑ starts ☑ finishes

Email: wendy.mason@sci.monash.edu.au

+ −

Submit

Grisu client

Job submission Monitoring File management File transfers

Basic job properties Job parameters

Current VO:
StartUp

Change

Applications
underworld

Additional Command(s) (optional)
Enter any additional commands in this field (otherwise leave blank)

InputFile

Browse

Additional File(s) (optional)
Select files one-by-one or by whole subdirectory

Site: Local Path: ./Users/wmasor

Share: /

..
.Koala
.Trash
.glite
.globus
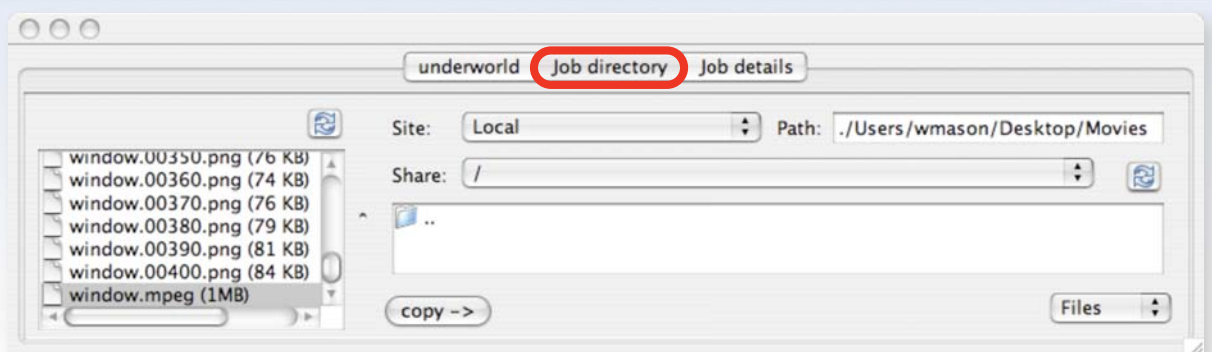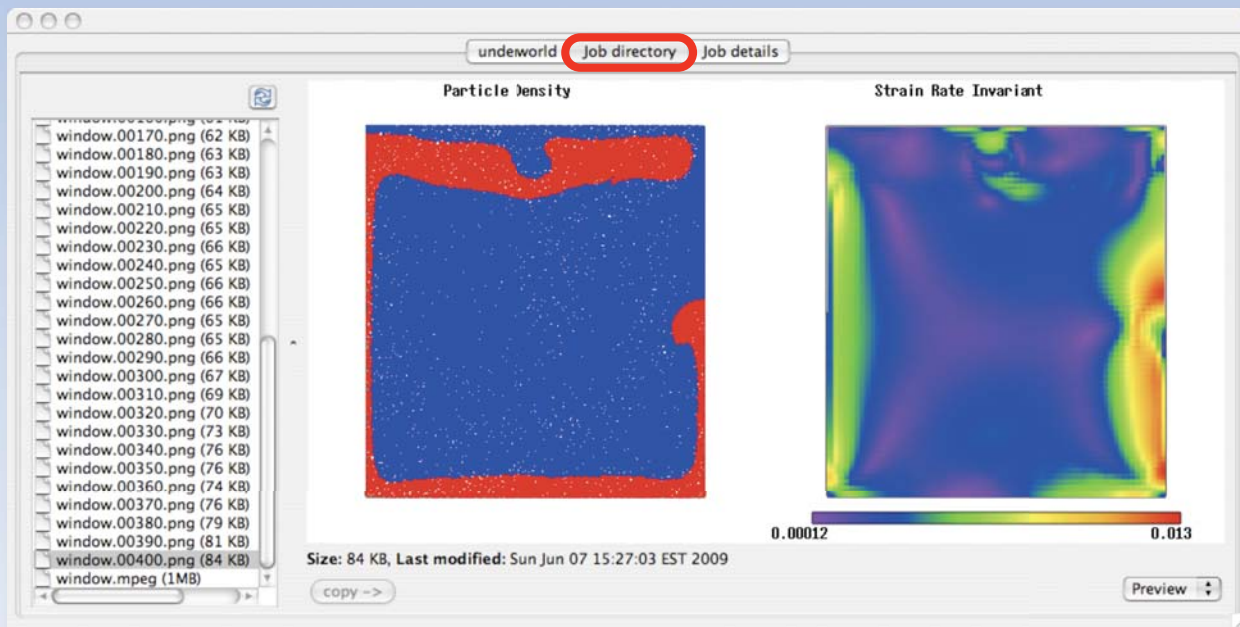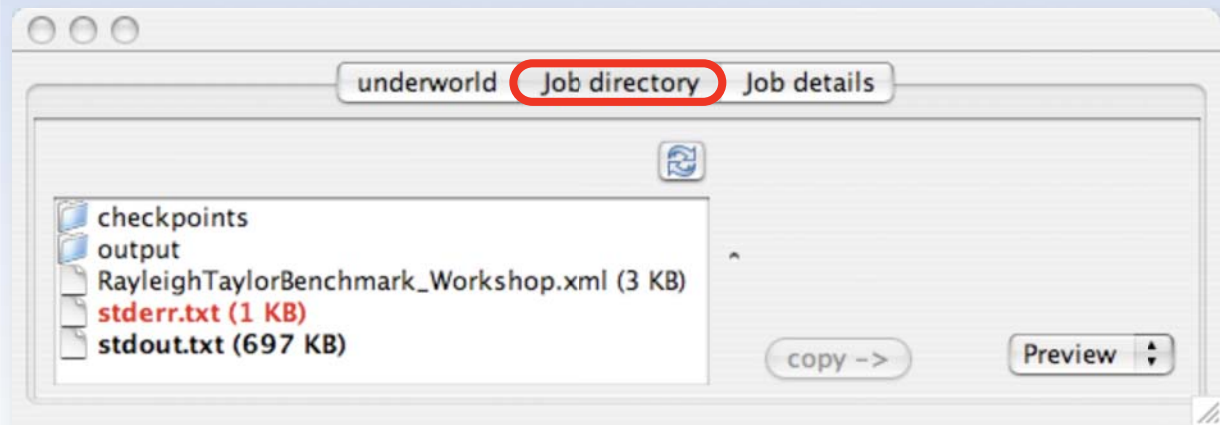.grisu
.ssh

-> −

* required

+ −
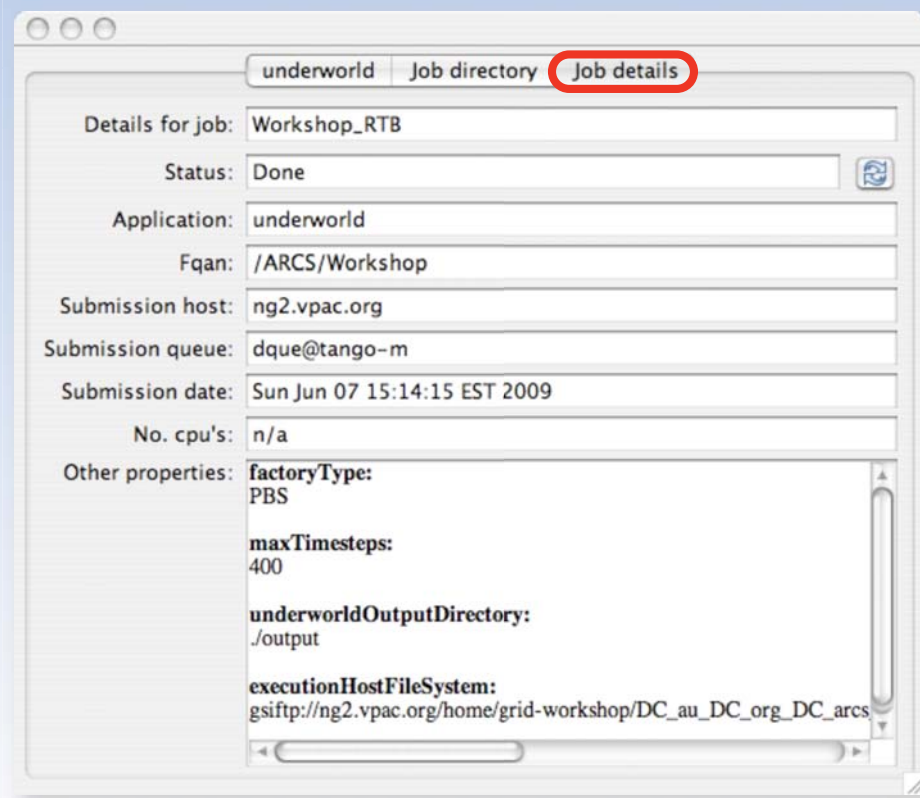
Submit

Underworld Post-processing Panel
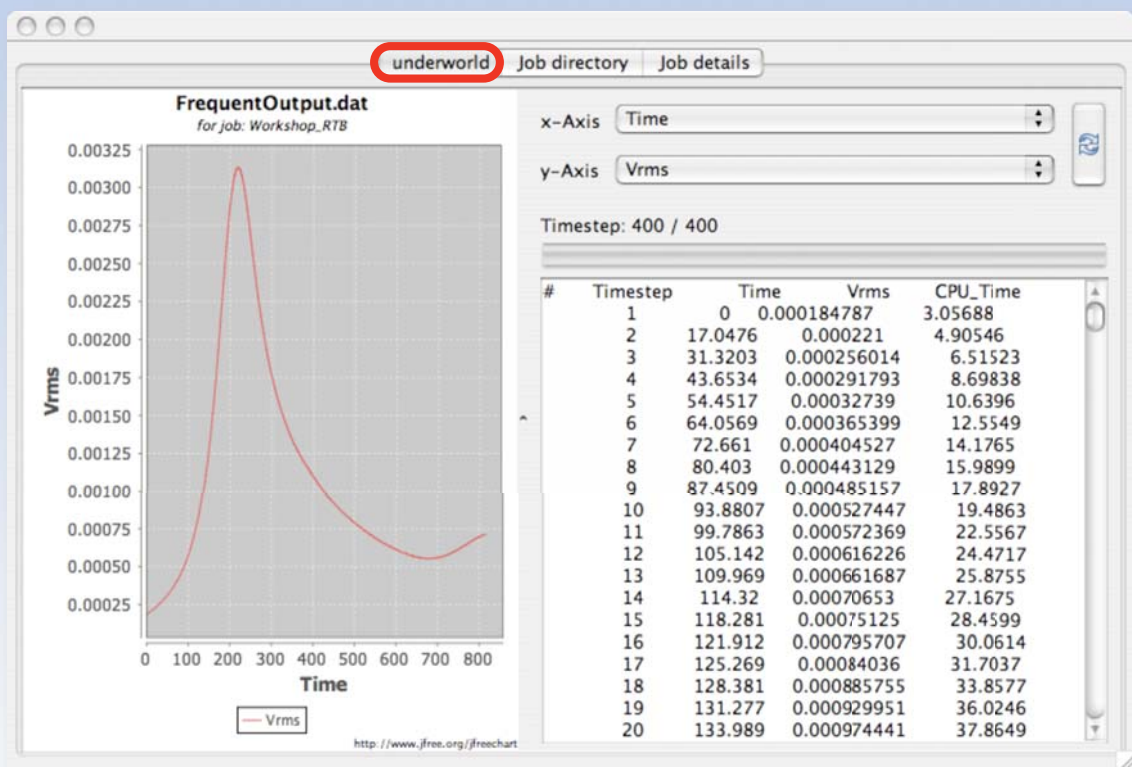
Job Directory (Generic)

- All files selected during job submission
- error (stderr.txt) & output (stdout.txt) files
- Underworld output subdirectory
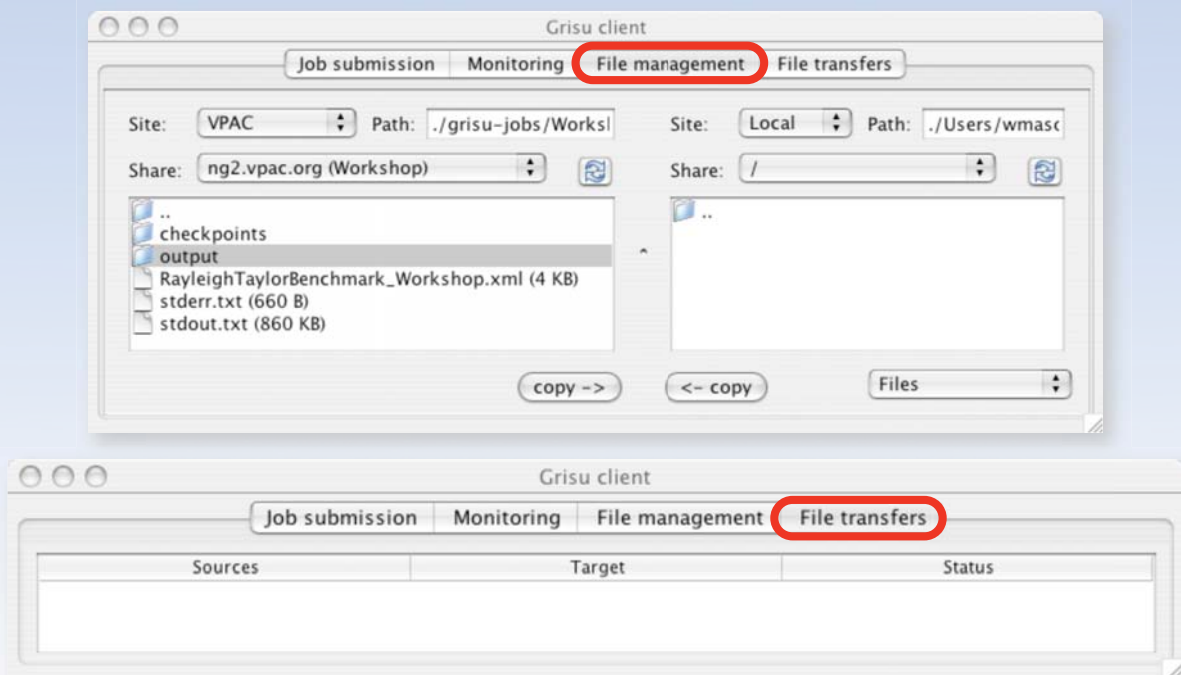- Underworld checkpoints subdirectory (if applicable)

Job Details (Generic)

File Management (Generic)

- Copy to local drive or account on another cluster

Underworld Grid Workshop

- held in June 2009 at Monash University
- supported by AuScope, ARCS, Monash e-Research Centre, VPAC & iVEC
- 20 attendees (plus presenters & support) included:
  - postgraduate students & academic staff from Victorian & interstate universities
  - staff from Geoscience Victoria DPI & Geoscience Australia
- hands-on component using own laptops, running Mac OSX, Linux & Windows
- logged into Grisu using Shibboleth with ARCS Identity Provider (IdP) accounts
- several exercises showcasing key features of both Underworld & Grisu

Underworld Grid Workshop - Survey

- 88% of respondents either agreed or strongly agreed:
  - ARCS Grid capabilities demonstrated were appropriate / useful to their research
  - would recommend the ARCS Grid to other researchers
- What some particularly liked about the workshop:

"Informative, and engaging."

"The interactive nature of it."

"The grid tool that was used/demonstrated was really interesting."

"Well presented and immediately usable procedures for using underworld on the grid."

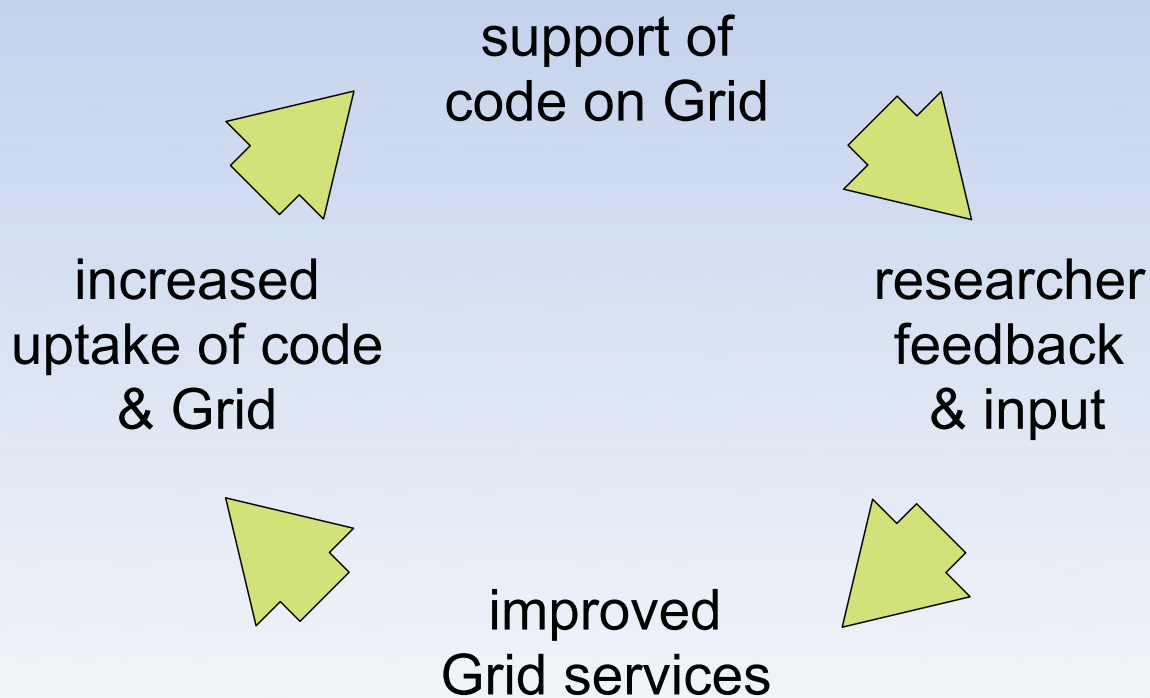"Showed me how easy it is to submit a model to the grid."

Outcomes

- interest in planned expansion of Underworld release module installations at additional sites (next release)

- upon request, AuScope SAM Vic ran an Underworld tutorial in the School of Geosciences at Monash University
  - attended by workshop participants & colleagues

- Monash Sun Grid & its latest Underworld release module published to the ARCS Grid
  - collaboration between AuScope SAM Vic, Monash e-Research Centre & ARCS
  - "free" to Monash users, enabling faster uptake
  - already being accessed using Grisu to run Underworld models

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Summary

support of
code on Grid

increased
uptake of code
& Grid

researcher
feedback
& input

improved
Grid services

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Acknowledgements

- **AuScope 'Simulation, Analysis, Modelling' Victoria**
- **Australian Research Collaboration Service (ARCS)**, in particular Markus Binsteiner who develops Grisu
- **Monash e-Research Centre**
- Support & use of supercomputing facilities at **VPAC, iVEC, NCI National Facility & Monash University**
- The Underworld Grid Workshop 2009 was supported by **AuScope, ARCS, Monash e-Research Centre, VPAC** & **iVEC**.
- The software Underworld, StGermain & gLucifer are being developed as part of **AuScope Ltd**.
- **AuScope Ltd** and **ARCS** (in part) are funded respectively through the "Structure and Evolution of the Australian Continent" and "Platforms for Collaboration (PfC)" capabilities of the National Collaborative Research Infrastructure Strategy (**NCRIS**), an Australian Government Initiative.

Further Information

Underworld

www.underworldproject.org

AuScope SAM Vic

www.auscope.monash.edu.au

ARCS

www.arcs.org.au