Photography encouraged

Absolute Velocity Estimates from a Glider Mounted ADCP

Callum Rollo[1] (c.rollo@uea.ac.uk) Karen J Heywood[1] Rob Hall[1] Alex Phillips[2]
[1]University of East Anglia, Norwich, UK [2]Marine Autonomous Robotics Systems group, Southampton UK

University of East Anglia

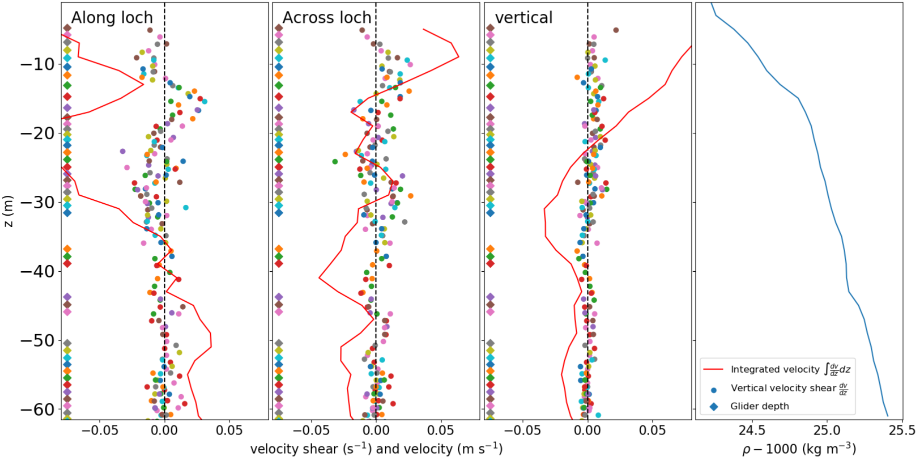
COAS Centre for Ocean and Atmospheric Sciences

National Oceanography Centre NATURAL ENVIRONMENT RESEARCH COUNCIL

NEXUSS

Absolute Velocity Estimates from a Glider Mounted ADCP

Callum Rollo[1] (c.rollo@uea.ac.uk) Karen J Heywood[1] Rob Hall[1] Alex Phillips[2]
[1]University of East Anglia, Norwich, UK [2]Marine Autonomous Robotics Systems group, Southampton UK

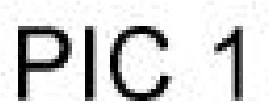


- Vertical shear of horizontal velocity coherent between ensembles
- Strong along loch shear across pycnocline

Photography encouraged

Absolute Velocity Estimates from a Glider Mounted ADCP

Callum Rollo[1] (c.rollo@uea.ac.uk) Karen J Heywood[1] Rob Hall[1] Alex Phillips[2]
[1]University of East Anglia, Norwich, UK [2]Marine Autonomous Robotics Systems group, Southampton UK



a) GEODAR show many approaching line features

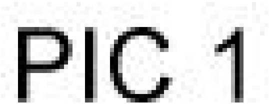
b) Flow-height measured by upward–looking FMCW radar.

$\Rightarrow$ Line features correspond to waves: We call them surges.

Photography encouraged

Absolute Velocity Estimates from a Glider Mounted ADCP

Callum Rollo[1] (c.rollo@uea.ac.uk) Karen J Heywood[1] Rob Hall[1] Alex Phillips[2]
[1]University of East Anglia, Norwich, UK [2]Marine Autonomous Robotics Systems group, Southampton UK



Major surges can exist in the avalanche body and they overrun each other. The origin of the major surges are secondary slab release (colored bars).

Photography encouraged

Absolute Velocity Estimates from a Glider Mounted ADCP

Callum Rollo[1] (c.rollo@uea.ac.uk) Karen J Heywood[1] Rob Hall[1] Alex Phillips[2]
[1]University of East Anglia, Norwich, UK [2]Marine Autonomous Robotics Systems group, Southampton UK

PIC 1

Video and laserscan data reveal the occurrence of slab releases.

Around 50 % of the total entrained volume entered the flow via slabs.

The slabs can be as large as the initial released slab. more . . .

Absolute Velocity Estimates from a Glider Mounted ADCP

Callum Rollo[1] (c.rollo@uea.ac.uk) Karen J Heywood[1] Rob Hall[1] Alex Phillips[2]
[1]University of East Anglia, Norwich, UK [2]Marine Autonomous Robotics Systems group, Southampton UK

. . . back to figure

Slabs enter at random locations into the flowing avalanche and their mass is no concentrated at the front.

⇒ Spreading the mass over the flow alters the runout.

	Time [s]	Volume [m^3]	Range [m]	Length [m]	Area [m^2]	Depth [m]
Avalanche #0019		V_t=29500			40411	0.73
initial release	3.4	V_0= 2188	2506	62	1400	1.56
slab #1	17.2	V_1= 521	2356	39	701	0.74
slab #2	23.4	V_2= 3503	2284	83	2753	1.28
slab #3	20–25*	V_3= 3345	2150	99	1880	1.78
slab #4	38.7	V_4= 4276	1945	153	3657	1.17
Avalanche #0017		V_t=78500			82632	0.95
initial release	5.2	V_0=15233	2402	191	12974	1.17
slab #5	12.2	V_5= 7620	2219	202	6043	1.26
slab #6	14.1	V_6= 5868	2215	166	5851	1.01
slab #7	25.6	V_7= 6307	1982	95	3320	1.90
slab #8	15–25*	V_8=10663	1947	253	5037	2.12

Table: Release time, Volume, Location and size parameters of all identified slabs.

Photography encouraged

Absolute Velocity Estimates from a Glider Mounted ADCP

Callum Rollo[1] (c.rollo@uea.ac.uk) Karen J Heywood[1] Rob Hall[1] Alex Phillips[2]
[1]University of East Anglia, Norwich, UK [2]Marine Autonomous Robotics Systems group, Southampton UK

PIC 1

Minor surges are only found in the head of large powder avalanches.

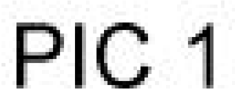
They are flow features (roll waves) in the energetic frontal region.

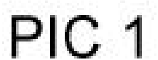
Their speed is high and constant when behind the front, but dramatically decelerate as soon they overtake the leading edge.

Photography encouraged

Absolute Velocity Estimates from a Glider Mounted ADCP

Callum Rollo[1] (c.rollo@uea.ac.uk) Karen J Heywood[1] Rob Hall[1] Alex Phillips[2]
[1]University of East Anglia, Norwich, UK [2]Marine Autonomous Robotics Systems group, Southampton UK





Minor surges were simulated with a 1D Voellmy–like model.
Model #1 describes the front, thats what usual models do.
Model #2 tries to follow every surge individually, but no deceleration.
Model #3 explains minor surges with 2 sets of friction parameters

⇒ The effective friction changes dramatically as soon as
the surge reaches t

Photography encouraged

Absolute Velocity Estimates from a Glider Mounted ADCP

Callum Rollo[1] (c.rollo@uea.ac.uk) Karen J Heywood[1] Rob Hall[1] Alex Phillips[2]
[1]University of East Anglia, Norwich, UK [2]Marine Autonomous Robotics Systems group, Southampton UK

- GEODAR radar is able to track internal surges (flow height waves) below the powder cloud of snow avalanches. Two types of surges exist: *Major* and *Minor surges* are differentiated by their length.
- Major surges can occur at random location in the flow and influence the mass distribution of the avalanche. Minor surges are ubiquitous feature of the fast–flowing energetic part in the frontal region of large powder avalanches.
- The effective friction between the front and the avalanche body differs. This must be explained with changes in the snow surface like smoothing and entrainment of the soft, upper snow layers. Numerical models not yet account for this.

Original template by Anselm Köhler
https://github.com/snowtechblog/pico-latex-presentation