# Antelope 5.0

March, 2010 Antelope User Group Meeting Prague, Czech Republic





## Why is Antelope 5.0 is a Major New Release?

- All release versions are fully 64-bit compliant
- Requires fully 64-bit compliant Operating Systems; no problem for Solaris and MacOSX users, may be a problem for Linux users
- Requires 64-bit processors
- No more orbserver64
- Can handle large databases, large SEED files (no more 32-bit limitations)
- Took three years of development work. We are certain there are remaining bugs. We ask for your help and patience in making this transition.



#### New P-arrival Based Mw Measurement, Mwp

- Implementation of a method originally developed by Tsuboi and further developed as a completely automated method by Marthijn de Kool at Geoscience Australia
- Can automatically produce accurate estimates of total moment magnitude for great earthquakes within 10 minutes of latest P arrival
- Implemented in Antelope as a new computational module for orbevproc
- Mwp=9.1, USGS/NEIC Mw=9.1 for 2004 Sumatra earthquake, Mwp=8.8, USGS/NEIC Mw=8.8 for 2010 Chile earthquake, Mwp=8.2, USGS/NEIC Mw=7.9 for 2008 China earthquake
- For 93 events with  $Mw \ge 6.0$ , Mwp-Mw mean error = 0.083 with standard deviation of 0.143



#### New Implementation of dbevents

- All perl using bplot (3) utility
- Much faster than old version
- More dynamic than old version
- Allows user specification of spreadsheet columns
- Can sort and subset events
- Map plotting will provide many different plot styles (color/symbol/size coding vs. depth, magnitude, etc.)
- More detailed data "drilling"
- Still in development, but a version will be provided in the 5.0 release



#### New Implementation of dbevents



55 15021 56 14980

6 7

8

 57
 14937
 268

 58
 14897
 268

 59
 14914
 268

 0
 27004
 10073

 1
 27000
 10073

 2
 26998
 10073

 3
 26990
 10073

 4
 26989
 10073

26985 10073 26984 10073 26982 10073 26982 10073 26981 10073

2694

X Dbevents														
	auth	rev depth mb			ms	mwp mw nde		idef na	nass latency		region			
	MbMwp	*	170.77	4.6				8	9	00:31:43	NEAR	COAST C	F CENTR	AL CHI
	MwpMs	*	10.28	5.5				18	24	00:45:29	NEAR	COAST C	F CENTR	AL CHI
- 😪 - 🗸 🖓	MwpMs	*	0.00	6.0	6.8	6.6		30	50	00:45:07	OFF COAST OF CENTRAL			L CHIL
	MsMwp	*	97.22	4.7				11	11	00:36:17	NEAR	EAST CC	AST OF	HONSHU
	MsMwp	*	27.13	4.8				9	9	00:35:05	XIZAN	G		
	MsMwp	*	34.88	4.8				11	11	00:36:50	NORTHERN SUMATRA, 1			NDONES
		*	0.00					10	11	00:10:15	OFF COAST OF		OREGON	[
an a	GS:US		10.00	5.0				57	0	00:24:03	NEAR	COAST C	F CENTR	AL CHI
	MwpMs	*	52.39	5.6	6.1	6.1		23	37	00:49:44 OFF		FF COAST OF CENTRAL CHI		
- 1	MbMwp	*	105.67	5.2			19		24	00:30:04	RYUKY	U ISLAN	DS, JAF	AN
	GS:US		35.00	5.0				69 0 02:42:10			NEAR COAST OF CENTRAL CHI			
	GS:US		184.50	5.2				23	0	00:22:20	FLORE	S REGIC	N, INDC	NESIA
	MwpMs	*	68.56	5.4	5.2			11	25	00:46:24	SOUTH SANDWICH ISLA			NDS RE
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	pMbMs	*	8.17	5.3				23	25	00:48:44	CHAGOS ARCHIPELAGO REGION			
	MwpMs	*	0.00	5.7	5.3			30	56	00:59:47	7 SOUTH INDIAN O			
	MwpMs	*	0.00	5.4				18	24	00:22:20	NEAR COAST OF CE			AL CHI
5   10073 03/14 19:10:51.200	USGS:US		35.00	5.0				30	0	00:19:06	NEAR	COAST C	F CENTR	AL CHI
0 10073 03/14 19:09:06.458	OtDblMbMsMwp	*	34.34	5.1				12	12	00:32:42	NORTHWESTERN KASHMIR			R
5   10073 03/14 18:23:06.660	OtDblMbMwp	*	105.44	4.8				16	16	00:36:52	PHILIPPINE ISLANDS REGIO			REGION
7 10073 03/14 14:01:18.700	USGS:US		35.00	5.0				14	0	00:23:09	NEAR COAST OF CENTRAL (			AL CHI
L 10073 03/14 14:01:18.300	USGS:US		35.00	5.0				37	0	00:35:18	NEAR	F CENTR	AL CHI	
4 10073 03/14 13:52:39.241	OtDblMbMwp	*	171.60	5.0				15	19	00:21:01	CENTR	AL CHIL	E	
2 10073 03/14 09:54:14.749	OtDblMwpMbMs	*	62.34	5.1				14	16	00:31:10	MINDANAO, PH?		ILIPPIN	ES
6 10073 03/14 08:08:08.530	OtDb1MbMwpMs	*	44.07	6.3	6.5	6.7		28	76	00:28:53	NEAR EAST COA		AST OF	HONSHU
3 10073 03/14 07:31:27.186	OtDblMbMwpMs	*	47.06	5.4				26	39	00:28:13	NEAR COAST O		F CENTR	AL CHI
5 10073 03/14 07:03:58.305	OtDblMbMwpMs	*	0.00	5.2				9	13	00:21:04	OFF EAST COAS		ST OF H	IONSHU,
2 10073 03/14 02:52:56.687	OtDblMbMsMwp	*	97.79					8	8	00:17:23	EL SALVADOR			
2 10073 03/14 00:57:46.642	OtDblMwpMbMs	*	64.61	6.3	5.9	6.5		29	55	00:34:25	HALMA	HALMAHERA, IN		A
3 10072 03/13 21:42:43.389	OtDblMbMwpMs	*	42.42	5.6	4.9			29	42	00:37:50	OFF EAST COAS		ST OF K	AMCHAT
5 10072 03/13 20:20:26.600	USGS:US		38.20	5.0				38	0	02:22:11	NEAR	COAST C	F CENTR	AL CHI
origin time	auth rev	latitude	long	itudo	denth	mh	mhitney	ms	mu	n mwn	Itney	mw	ndef	nass
03/14 08:08:05.300 III	GS:US	37.780	2 14	1.5623	39.00		nilo fuic y	ma	inw	p nwp	iure y	6.6	299	2.8
03/14 08:08:04.007 OtDb1Mb	MwoMs *	37,961	5 14	1.0119	4.74	6.4	01:13:4	7 6.	5	6.7 01:3	13:47		2.8	68
03/14 08:08:11.907 OtDb1Mb	MwpMs *	37,994	8 14	1.0116	68.42	6.3	01:06:3	6.	5	6.7 01:0	06:38		2.8	69
03/14 08:08:06.934 OtDblMb	MwpMs *	38,081	1 14	1.1086	25.28	6.4	00:31:3	15 6.	5	6.7 00	36:07		27	77
03/14 08:08:08.469 OtDb1Mb	MwoMs *	38,100	6 14	1.0663	38,41	6.3	00:30:0	5 6.	5	6.7 00:	35:00		27	76
03/14 08:08:08.530 OtDb1Mb	MwpMs *	38,023	4 14	1,2130	44.07	6.3	00:29:1	7 6	5	6.7 00.	33:55		2.8	76
03/14 08:08:08.531 OtDb1Mb	MwoMs *	38,124	3 14	1.0091	38.04	6.4	00:28:0	7 6.	5	6.7 00:	• 32 • 51		27	7.5
03/14 08:08:08.516 OtDblMb	MwnMs *	38,123	2 14	1.0144	37.78	6.4	00:28:0	7 6	5	6.7 00.	31 - 47		27	75
03/14 08:08:08 592 OtDb1Mb	MumMe *	38 128	7 14	9869	39.14	6.3	00.24.3	18 6	5	6.7 00.3	29.33		26	70
03/14 08:08:06 548 OtDb1Mb	MumMe t	38 104	6 14	1 0025	21 99	6.4	00.22.3	1 6	5	6.7 00.3	24.22		26	72
03/14 00.00.00.340   OCDDING	umpus /	50.104	0 14.	1.0023	61.99	0.4	1 00.22.3	. 0.	J	0.1   00.2	54.66		20	1 14



**March 2010** 

#### New Filtering Capabilities

- Implemented as standard Antelope time-domain filters using the wffil(3) API
- SPF arbitrary set of S-domain numerator and denominator polynomial factors
  - Generalized first and second order polynomials
  - Can be used to apply inverse sensor responses or to equalize response functions
  - Can be used anywhere a filter string appears in Antelope
  - Note that looking up particular instrument responses and converting from poles & zeros representations to S-domain polynomial factor representations is not done automatically by this filter



#### New Filtering Capabilities - Instrument Deconvolution





March 2010

New Filtering Capabilities - Instrument Deconvolution

- Need to compose filter SPF string from instrument response poles and zeros.
- New Response perl module to support manipulation of Antelope response structures
- Need to worry about inherent deconvolution instabilities



## New Filtering Capabilities

- DECIMATE arbitrary FIR filter based decimation
  - FIR filters specified through normal Antelope FIR response files
  - Can be used to resample data to lower sample rates using real datalogger FIR filters
  - Can be used anywhere a filter string appears in Antelope. In particular can be used with real-time packet data, such as in orbmonrtd and orbwfproc.
  - Note that looking defining the FIR filter is not done automatically by this filter



#### New Filtering Capabilities - Resampling



BRTT

March 2010

## Updated GSN Processing Template

- Still available through rtdemo
- Updated to include new Mwp magnitude computations
- Updated metadatabase (note that IRIS has a tendency to rename data channels)
- Updated to use dborb2db and db2msd and
  - Insensitive to incoming data fragmentation
  - Little or no wfdisc fragmentation regardless of incoming data
  - Eventually achieve good level of SEED compression





0	00			2	🗙 dbpick:/d	b/gsn				
(	Traces v	(Amp: A	v) Filter: N	v) (Add '	Time Mrk)					
	TRQA BHZ_00	+ml	Ppm~~V.	+РКіКР		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~				
	LVC BHZ_00		Powp A	/n/// #/Ki#6	www.en.	·····	•••••			
귀	NNA BHZ_00	[		ms WRIKIK P			····· t ····		··········	
	SAML BHZ_00	[	+P Imwp	РКіКР	Wins Human	·····	<u> </u>		<del> </del>	
	PMSA BHZ_00	[	+ <mark>F</mark> -mwp-+8	s + РКМ	www.weileylinewww.	······································		<u> </u>		
	HOPE BHZ_00			<mark>8РКЖ</mark> М	1mmmmmmmm	de-telle-treene				
	OTAV BHZ_00	[	+P-mwr	<b>→S +PKiK</b> P	mymmin	15 MM	refeall-come de-star-lan-s	**************************************	······································	······
	SDV BHZ_00	[	+p <b>R</b>	-BKiKP		~1. Manhard Man	When my more	****	paralan (Uparana da a	····
	RCBR BHZ_00	[		nwp #BkikP		ms W/mw	here and the second second			· · · · ·
	BCIP BHZ_00	[	<u></u> <u></u>	wp <b>+rsk</b> ikP		www.www.www	whenter	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		lor-mandadaran Rada Canadar, anno annoa
	JTS BHZ_00	[		mwp PSiKP	↓v M	pm Proventing	how the man	······································		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	TRIS BHZ_00	[		-mwp <mark>RIS</mark> KR	mmm	My ms www	hlamanna		www.www.www.	1000-0
	GRGR BHZ_00	[	<u>-</u>	mwp KP		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ms	······	P-www.	
	PTCN BHZ_00			mwp (mwp P	1 <u>ms</u>	Wywwwwwwwwww		the specific and a specific sp	······	
	BBGH BHZ_00	[	+ <mark>Pvp</mark>	+PKBK		~~~~ms/m	www.www.	<b>~~~</b> ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	dar-stranarianta	
	MTDJ BHZ_00	[	P	+ PKiK <b>B</b>		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	www.www.	เ <i>งุการครส</i> ุปุ <sub>ไ</sub> ปมารรดงการกา	•• Provention	······································
	ANWB BHZ_00	[	+ Pyp	+PKiK8		www	Www-ms W~+	Munnen man	~ <b>P</b> ************************************	
	SDDR BHZ_00			•+PKiKB	l	www	mbrand Milling	าปูรีราวจากเป็นจากราวอาการที่ระบ	~₽~~~~	10111111111111111111111111111111111111
	GTBY BHZ_00			- mwp PKiKE	•	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	www.www.	human manager	- <b>P</b>	****
	GRTK BHZ_00			<mark>∙••</mark> mwp\KiK₽	\$	mmmm	VWW/wins	Mpices M Providence of the second	n-ph/p-arspanned	v
	TEIG BHZ_00			mwp	ਙᡰᢩੑ੶੶੶੶੶੶੶	᠁ᡰ᠊᠊᠋᠌ᡃ᠕ᢧᠰᠰ	murrow	<b>งงุกมาหมู่ไหลูการจากเห</b> ตามา	mpuumm	
	ASCN BHZ_00		+P	ир +РКіКГ	<u>+</u> s		ms MMM MWW	Whenmallin-mannamana		
	SHEL BHZ_00		P	+F <mark>mw</mark> r	]+ <del>S </del>		ms Www.			
	VNDA BHZ_00		+P	+РКіКГ	<u>+8</u>	www.	www.ms.llww	www.www.entilititeerseerseerseerseerseerseerseerseerseer	๙ <b>ๅๅๅๅ๚๚</b> ๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛	(N))))))))))))))))))))))))))))))))))))
	SACV BHZ_00			P <mark>-~~+PKi</mark> m	wp <mark>&amp; Sele   </mark>			www.wims		
	SLBS BHZ_00			P+PK m	wp KSac		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	introduction and the second second	MANY Preserve	
	HKT BHZ_00			Prese PKim	wp Kanch	~~ <u>~</u>	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	www.www.ms	www.howdulle	wp-m-m-watation-
	TX31 BHZ			<u>Р</u> РКК	P <mark>∔SKEDa</mark> ¢		^\\\\\		Plannts Promision	·····
	SUR BHZ_00		+	Р РКК	P +9K6a¢ -~~	~ <b>~~</b> ~~~ <b>P</b> ~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	wins Www.w		······································
	WCI BHZ_00		+	<b>Р_</b> РК К	P <b> +SK€8</b> ¢ ······	·····	mmm-1/1	www.www.wwwww	(which P when	Hullman (1411
	SSPA BHZ_00		+	<u>Р</u> РКК	P +SK8ad ∽∽	~~~_	m	while	anallinalling	how when we we have the second
	TUC BHZ_00		+	Р тркк	P +SKSad ∕	┉┉┈┷╍╂┝╴┣┛┉╴	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	May May Marine	when white	
	ANMO BHZ_00		•	₽	P +8K842				การสมส์สูปการสมส์การสารม	
	HRV BHZ_00			<mark>₽</mark> ∽ •РКіК	P ++SK821	~ <b>P</b> ~-	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Milan-Matan Mil	havann hhran hann
	CASY BHZ_00			₽ +РКК	P +SK342		~-~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	is proved with	he would be an a set of the
	TSUM BHZ_00	20.00.000	00:40:00.000	PKiK	P	~~~~~tpt	07:10:02 0	V~VWWWWWWWW	MMM MMM	07:20:00.000
		2010058	2010058	201005	58 2	010058	2010058	2010	058	2010058