Second draft array course outline
Using Ambient Vibration Array Techniques for Site Characterization
Monday, 21st Nov. 2005 to 25th Nov. 2005

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September 1, 2005

1 Course outline

	Monday	
13:30	Reception and welcome	
	Technical issues - programme overview	
14:00-14:45	Introduction	
	physical background / introduction to ambient vibration anaylsis - Goals! • what is known about the nature of noise - nature of ambient noise (overview/resume) • link between measurement structure and site response	Cecile
14:45-15:00	Coffee break	
15:00-17:15	Basic Array Processing Concept	
	• Overview of methods • Arrays as multitracefilter operation (shift and sum) • f-k domain	Matthias

	Tuesday	
9:00-10:30	Array Geometry and Response	
	Spatial sampling issues: • Linear array example - relation, interdependece between N, D, d with array response • extension to 2D - geometries (subitems here) • limits of array resolution/aliasing – wavelength criteria (table display of relation D, N → k_{min}, k_{max} • what a priori information can be helpful for estimating the target wavelength range	Matthias
10:30-10:45	Coffee break	
10:45-12:15	Array Geometry and Response – Practicals	
	• Tutorial for array design - considering the previously discussed matter • test behaviour with single source (links to f-k computation and grid sampling issues - parameter of f-k computation explained here) • (all practicals done with build_array)	Matthias
12:15-14:00	Lunch break	
14:00-15:30	GEOPSY - round trip and first steps	
	Tutorial for data base creation and capabilities / tools within GEOPSY (data examples used: M2- single/multi source wavefield)	Marc
15:30-15:45	Coffee break	
15:45-17:15	Conventional FK - Practicals	
	Tutorial for f–k analysis of single/multi M2 model data sets Observation of frequency limits - connection with both array geometry and site structure (HP-filter effect)	Marc Matthias

	Wednesday	
9:00-10:30	Capon's Method – high resolution f–k	
9:00-9:45	Viewing f-k in the context of cross correlation (covariance) matrix	Matthias
	Spatial weighting of sensor couple contributions → Capon's method	Matthias
	Technical implementation - stabilization by block-averaging, sensor normalization and diagonal loading before hermitian matrix inversion	Matthias
9:45-10:30	hands-on - processing M2 data sets with Capon's method	Matthias
	discussion of results - comparison to f–k	Matthias
10:30-10:45	Coffee break	
10:45-12:15	SPAC Method	
10:45-11:30	Introduction to SPAC (Aki) – Assumptions, etc.	Cecile
	Extension for imperfect array-layouts (Bettig et al., 2001)	Cecile
	Technical implementation – Parameters, etc.	Marc
11:30-12:15	Hands-on - processing M2 data sets with SPAC	Marc
	Use of tools for comparing to f–k results – discussion	Marc
12:15-14:00	Lunch break	
14:00-15:30	DC Inversion	
14:00-14:45	Basics of Inversion	
	Forward problem – inverse problem	Marc
	Linear problems - overview - examples for data space, model parameter space	Marc
	non-linear problems, overview of approaches	Marc
	DC-inversion - our non-linear problem to be attacked	Marc
14:45-15:30	outline of NA-sampling - benefits - general problem of sampling techniques, etc.	Marc
15:30-15:45	Coffee break	
15:45-17:15	Inversion - Practicals (first steps)	
	use of na_viewer (dinver!)	Marc
	Tutorial for creation of synthetic DC and inversion	Marc
	effects of restricting search ranges, type of parametrization, what are the pitfalls!	Marc
20:00-	Workshop Dinner	

	Thursday	
9:00-10:30	Inversion - Practicals (Advanced)	
	Importing analysis results for M2 data sets (f–k, Capon, SPAC)	Marc
	Combining/editing obtained results for inversion target	Marc
	Inversion	Marc
10:30-10:45	Coffee break	
10:45-12:15	Discussion of results for M2-model	
	General discussion on results obtained for M2-model	Matthias
	Important: Pointing out frequency limitation, interpretation problems, etc.	Matthias
12:15-14:00	Lunch break	
14:00-15:30	Analysis and inversion of test data sets I	Cecile
	Free practicals for participants on predefined data sets (3 data sets) – contains choosing array layouts from set of virtual sensor locations, analysis with all array methods and inversion	
15:30-15:45	Coffee break	
15:45-17:15	Analysis and inversion of test data sets II	Cecile
	Free practicals for participants on predefined data sets (2 data sets) – contains choosing array layouts from set of virtual sensor locations, analysis with all array methods and inversion data sets are 1 synthetic but no longer so easy than M2 and 1 real data example	

	Friday	
9:00-10:30	Discussion of results from data sets	(later - all)
	Report of participants about their results general discussion of variations obtained for different data sets (M2, 2nd synthetic and real)	
10:30-10:45	Coffee break	
10:45-12:15	Summary of SESAME findings	(all)
	Presentation by Cecile, Marc and Matthias presenting the main findings within SESAME in particular: recommendations, what are the still open questions and: THIS is not a black box!	
12:15-14:00	Lunch break	
14:00-	Departure of Participants and final discussion for those who want	
14:45-15:00	Coffee break	
15:45-17:15	Open Discussion	

2 Detailed course contents