



4D-MB 1st Annual Short Course

February 1-2, 2018



*Seismic tomography for non-seismologists –
methods & potential applications for imaging
mountain belts*

Introduction



- Concept of SPP Workshops – to provide us with a multi-disciplinary background
- Lectures will be filmed and edited, will then be archived at the FU and linked on our website. There is no special microphone, so please speak up if you ask a question!
- Lunchtime – we must be at the Mensa before 12 to avoid crowds; pay yourselves.
- Group photo in front of Haus C at 12:45
- Dinner – Restaurant **Estiatorion Jevssis** in Steglitz (19:00); travel by bus, tickets already purchased, will be handed out after the final lecture this afternoon. We leave at 18:30 sharp, possibly in two buses. Leaders are **M. Grund and Philip Gross**. Dinner costs of lecturers and participants will be covered by SPP.

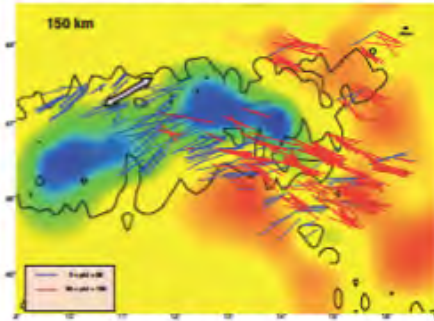
Class makeup

	Last Name	First Name	Email	Institution, Position	SPP-Project	Project Title / Comments
1	Balling	Philipp	philipp.balling@uni-jena.de	U Jena, PhD	SPP related	student of Kamil Ustaszewski, DFG project in the Dinarides
2	Giese	Joerg	joerg.giese@fu-berlin.de	FU-Berlin, Postdoc	SPP related	DFG project in the Dinarides
3	Gross	Philipp	philip.gross@fu-berlin.de	FU Berlin, PhD	PL534/4-1	Kinematic and thermobarometric evolution of subducting continental crust
4	Grund	Marc	m.grund@live.de	FU-Berlin, PhD	HA 2403/22-1	Linking surface kinematics to deep structure of the Adriatic indenter near a potential subduction-polarity switch - the Giudicarie Belt (Southern Alps)
5	Gruetner	Christoph	christoph.gruetner@uni-jena.de	U Jena, PI & Postdoc	GR 4371/1-1	Earth surface response to Quaternary faulting and shallow crustal structure in the eastern Adria-Alpine collision zone and the Friulan plain
6	Hauke	Matthias	mhaue@uni-bonn.de	U Bonn, PhD	FR700/21-1	Slab factory - ocean formation and subduction in the Western Alps
7	Haxter	Martin	martin.haxter@gfz-potsdam.de	GFZ Potsdam, Postdoc	WE 1457/22-1	Data repository, SWATH D
8	Hofman	Rens	renshofman@gmail.com	FU Berlin, PhD	KU2484/5-1	From Top to Bottom- Seismicity, motion patterns & stress distribution in the Alpine Crust
9	Keppeler	Ruth	rkep@uni-bonn.de	U Bonn, Postdoc	KE 2268/2-1	Alpine subduction in a new light - improved velocity models for geophysical probing of deep structure
10	Krsnik	Emilija	emilija.krsnik@senckenberg.de	U Frankfurt, PhD	ME 4955/1-1	Neogene Paleoelevation and Paleoclimate of the Central Alps - Linking Earth Surface Processes to Lithospheric Dynamics
11	Kruse	Jan Philipp	jp.kruse@gmail.com	U Frankfurt, PhD	KA 3367/4-1	Constraining the dynamics of the present-day Alps with 3D geodynamic inverse models
12	Kummerow	Jörn	joern@zedat.fu-berlin.de	FU Berlin, PI	KU2484/5-1	From Top to Bottom- Seismicity, motion patterns & stress distribution in the Alpine Crust
13	Louis	Sarah	sarah.louis@uni-goettingen.de	U Göttingen, PhD	HA 7660/4-1	Foreland basin evolution and its sensitivity to plate reorganization...
14	Meeßen	Christian	christian.meessen@gfz-potsdam.de	GFZ Potsdam, ??	SCHE 674/7-1	Integrated 3D structural, thermal, gravity and rheological modeling of the Alps and their forelands
15	Metzger	Sabrina	sabmet@gmail.com	GFZ Potsdam, PostDoc	not SPP member	InuAr (section 4.1, Oncken)
16	Mroccek	Stefan	s.mroccek@outlook.com	GFZ Potsdam, PhD	TI 316/8 - 1	Understanding subduction by linking surface exposures of subducted and exhumed crust to geophysical images of slabs
17	Munzarova	Helena	helena@ig.cas.cz	U Prag, PhD	AlpArray member	AlpArray member (not SPP) - students of Jarka Plomerova (Prag)
18	Najafabadi	Azam	azam@gfz-potsdam.de	GFZ Potsdam / FU-Berlin, PhD	HA 3326/5-1	Linking surface kinematics to deep structure of the Adriatic indenter near a potential subduction-polarity switch - the Giudicarie Belt (Southern Alps)
19	Peterson	Gesa	gesap@gfz-potsdam.de	GFZ Potsdam	CE 223/6-1	From Top to Bottom- Seismicity, motion patterns & stress distribution in the Alpine Crust
20	Reuber	Georg	reuber@uni-mainz.de	U Mainz, PhD	KA 3367/4-1	Constraining the dynamics of the present-day Alps with 3D geodynamic inverse models
21	Scheck-Wenderoth	Magdalena	magdalena.scheck@gfz-potsdam.de	GFZ Potsdam, PI	SCHE 674/7-1	Integrated 3D structural, thermal, gravity and rheological modeling of the Alps and their forelands
22	Schmidtke	Michael Jared	michael.schmidtke@uni-bonn.de	U Bonn, PhD	KE 2268/2-1	Alpine subduction in a new light - improved velocity models for geophysical probing of deep structure
23	Schmitz	Benjamin	b.schmitz@uni-jena.de	U Jena, PhD	SPP related	student of Kamil Ustaszewski, DFG project in the Dinarides
24	Sebera	Josef	josef.sebera@asu.cas.cz	U Kiel	EB255/6-1	Integrated 3D structural, thermal, gravity and rheological modeling of the Alps and their forelands
25	Sippel	Judith	sippel@gfz-potsdam.de	GFZ Potsdam, PI	SCHE 674/7-1	Integrated 3D structural, thermal, gravity and rheological modeling of the Alps and their forelands
26	von Hagke	Christoph	christoph.vonhagke@emr.rwth-aachen.de	RWTH-Aachen	HA 7660/3-1	Foreland basin evolution and its sensitivity to plate reorganization...
27	Wolf	Felix	felixnoahwolf@gmx.de	Geomar/U Kiel, PhD	LA 2970/3-1	Generation and destruction of lithosphere in the Ligurian Sea
28	Zertani	Sascha	sascha.zertani@fu-berlin.de	FU Berlin, PhD	JO349/11-1	Understanding subduction by linking surface exposures of subducted and exhumed crust to geophysical images of slabs
Emails: philipp.balling@uni-jena.de, joerg.giese@fu-berlin.de, philip.gross@fu-berlin.de, m.grund@live.de, christoph.gruetner@uni-jena.de, mhaue@uni-bonn.de, martin.haxter@gfz-potsdam.de, renshofman@gmail.com, rkep@uni-bonn.de, emilija.krsnik@senckenberg.de, jp.kruse@gmail.com, joern@zedat.fu-berlin.de, sarah.louis@uni-goettingen.de, christian.meessen@gfz-potsdam.de, sabmet@gmail.com, s.mroccek@outlook.com, helena@ig.cas.cz, azam@gfz-potsdam.de, gesap@gfz-potsdam.de, reuber@uni-mainz.de, magdalena.scheck@gfz-potsdam.de, michael.schmidtke@uni-bonn.de, b.schmitz@uni-jena.de, josef.sebera@asu.cas.cz, sippel@gfz-potsdam.de, christoph.vonhagke@emr.rwth-aachen.de, felixnoahwolf@gmx.de, sascha.zertani@fu-berlin.de						
Lecturers						
1	Fichtner	Andreas	andreas.fichtner@erdw.ethz.ch	ETH Zürich		
2	Haberland	Christian	christian.haberland@gfz-potsdam.de	GFZ Potsdam		
3	Handy	Mark	mark.handy@fu-berlin.de	FU Berlin		
4	Igel	Heiner	heiner.igel@geophysik.uni-muen.de	LMU München		
5	Kastle	Emanuel	emanuel.kastle@upmc.fr	FU Berlin		
6	Kissling	Eduard	kissling@tomo.ig.erdw.ethz.ch	ETH Zürich		
7	Meier	Thomas	meier@geophysik.uni-kiel.de	U Kiel		
8	Rümpker	Georg	rumpker@geophysik.uni-frankfurt.de	U Frankfurt		
9	Ryberg	Trond	trond.ryberg@gfz-potsdam.de	GFZ Potsdam		
10	Sens-Schönfelder	Christoph	christoph.sens-schoenfelder@gfz-potsdam.de	GFZ Potsdam		
11	Tilman	Frederik	tilmann@gfz-potsdam.de	GFZ Potsdam / FU-Berlin		
12	Weber	Michael	mhw@gfz-potsdam.de	GFZ Potsdam / U Potsdam		

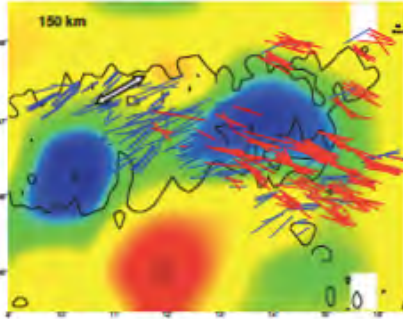
- 11 lecturers
- 28 participants – 21 PhDs (17 SPP, 3 SPP-related), 7 advanced researchers (1 AA, 3 SPP PIs), **25 non-seismologists**
- 5 people turned down

Dilemma - contrasting seismological models

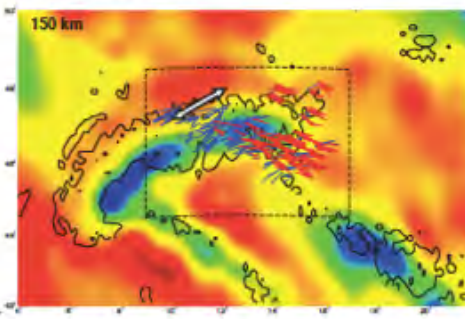
Mitterbauer et al., 2011



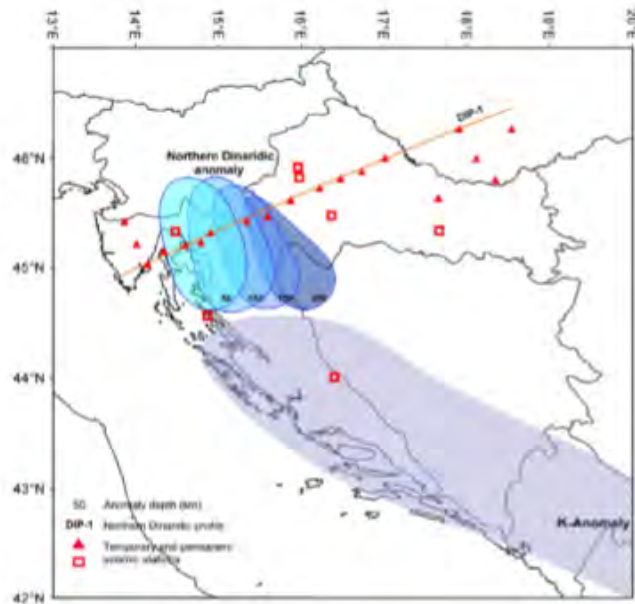
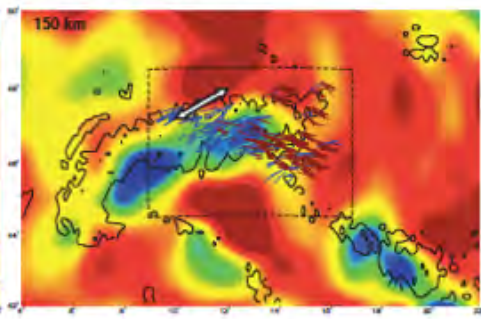
Lippitsch et al., 2003



Koulakov et al., 2009



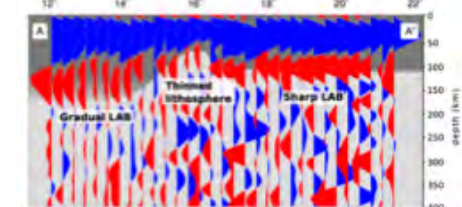
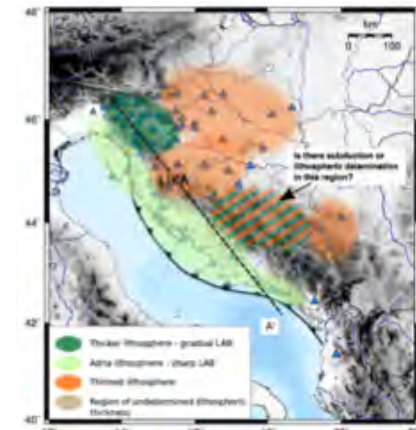
Piromallo & Morelli, 2003



Sumanovas & Dudjak 2017



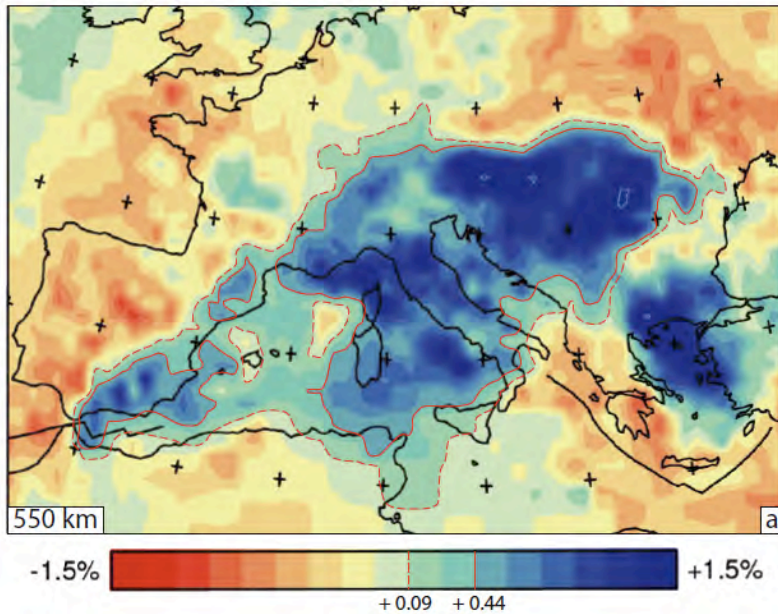
Simple Geologist



Belenic et al. 2018

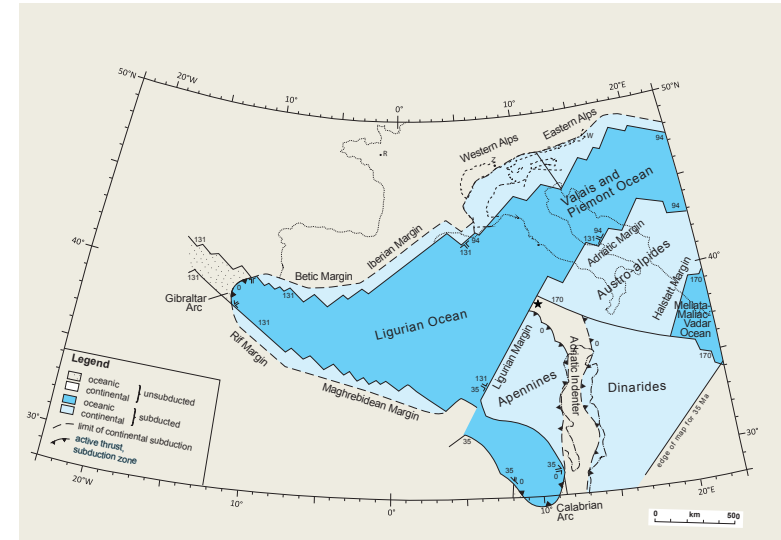
Aim - quantification of subducted crust & mantle

Seismology

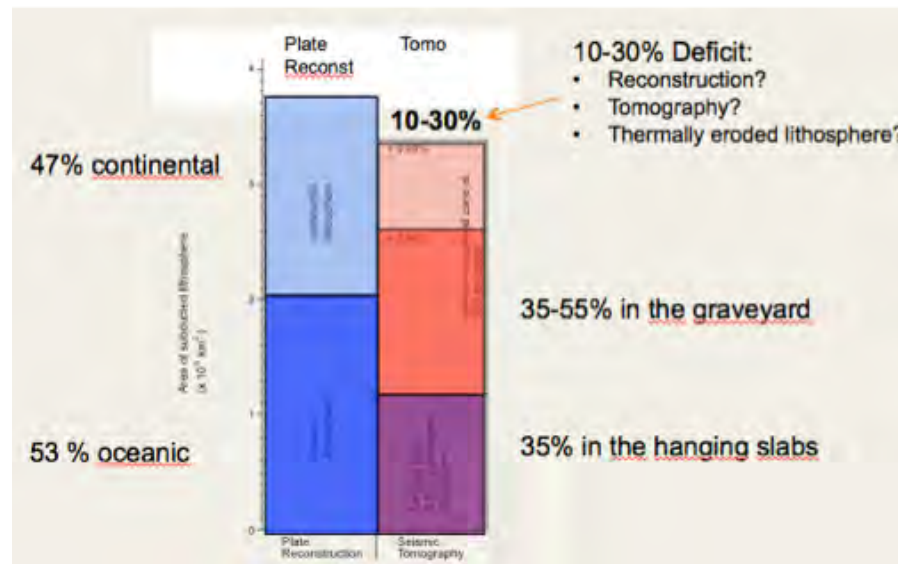


Amaru 2007, Hall & Spakman 2015

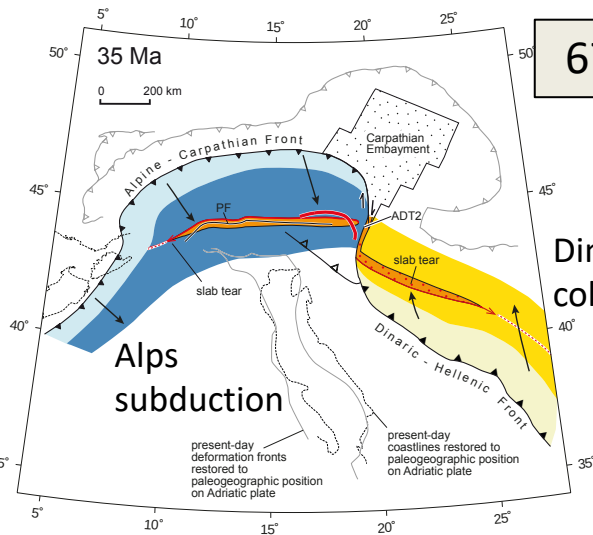
Tectonics



Handy et al. 2010

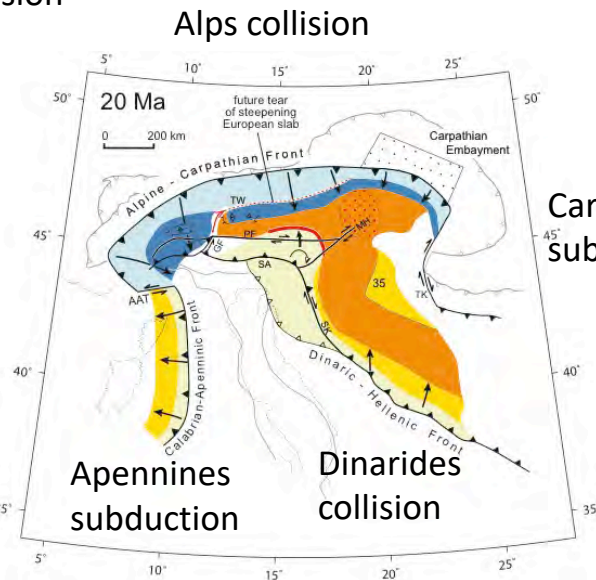


What we *really* want - Slab motions in time (4D)



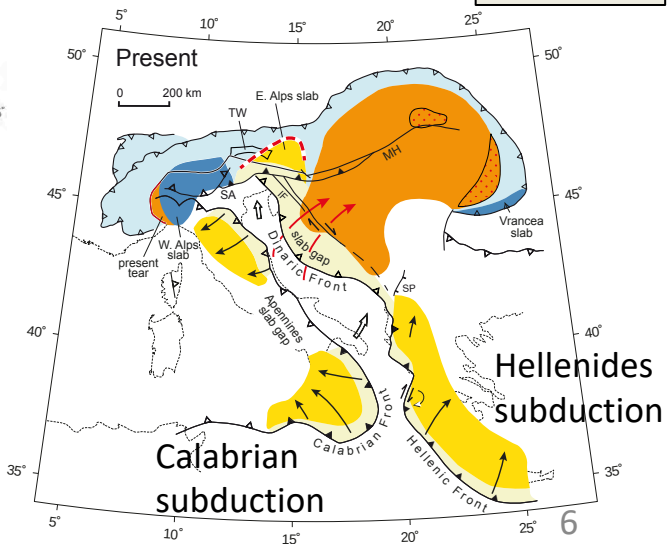
67–35 Ma

Dinaride collision



35–20 Ma

Carpathian subduction



Present

Lithosphere-Asthenosphere



Thursday morning, Feb. 1st, 2018



09:00-09:30 Coffee

09:30-09:45 Mark Handy (FU-Berlin) - *Introduction*

09:45-10:45 Eduard Kissling (ETH-Zürich) – *Overview of seismic imaging methods*

10:45-11:45 Andreas Fichtner (ETH-Zürich) – *Developments in full waveform inversion*

11:45-13:00 Lunch at Mensa, Group Picture

Thursday afternoon, Feb. 1st, 2018



- 13:00-14:00 Trond Ryberg (GFZ-Potsdam) *Bayesian approach in seismic tomography*
- 14:00-15:00 Heiner Igel (LMU-München) *Numerical methods in tomography*
- 15:00-15:30 Coffee**
- 15:30-16:15 Frederik Tilmann (GFZ) *Receiver functions*
- 16:15-17:00 Georg Rumpker (Frankfurt) *Seismic anisotropy & Shear-wave splitting*
- 17:30-18:15 Beer with the students at the GeoCafe
- 19:00 Dinner in Berlin-Steglitz**

Friday morning, Feb. 2nd, 2018



08:30-09:00 Coffee

09:00-10:00 Thomas Meier (Kiel) – *Surface-wave tomography*

10:00-10:40 Christoph Sens-Schönfelder (GFZ) *Ambient noise tomography – Fundamentals*

10:40-11:15 Emanuel Kästle (Paris) - *Ambient noise tomography – Applications*

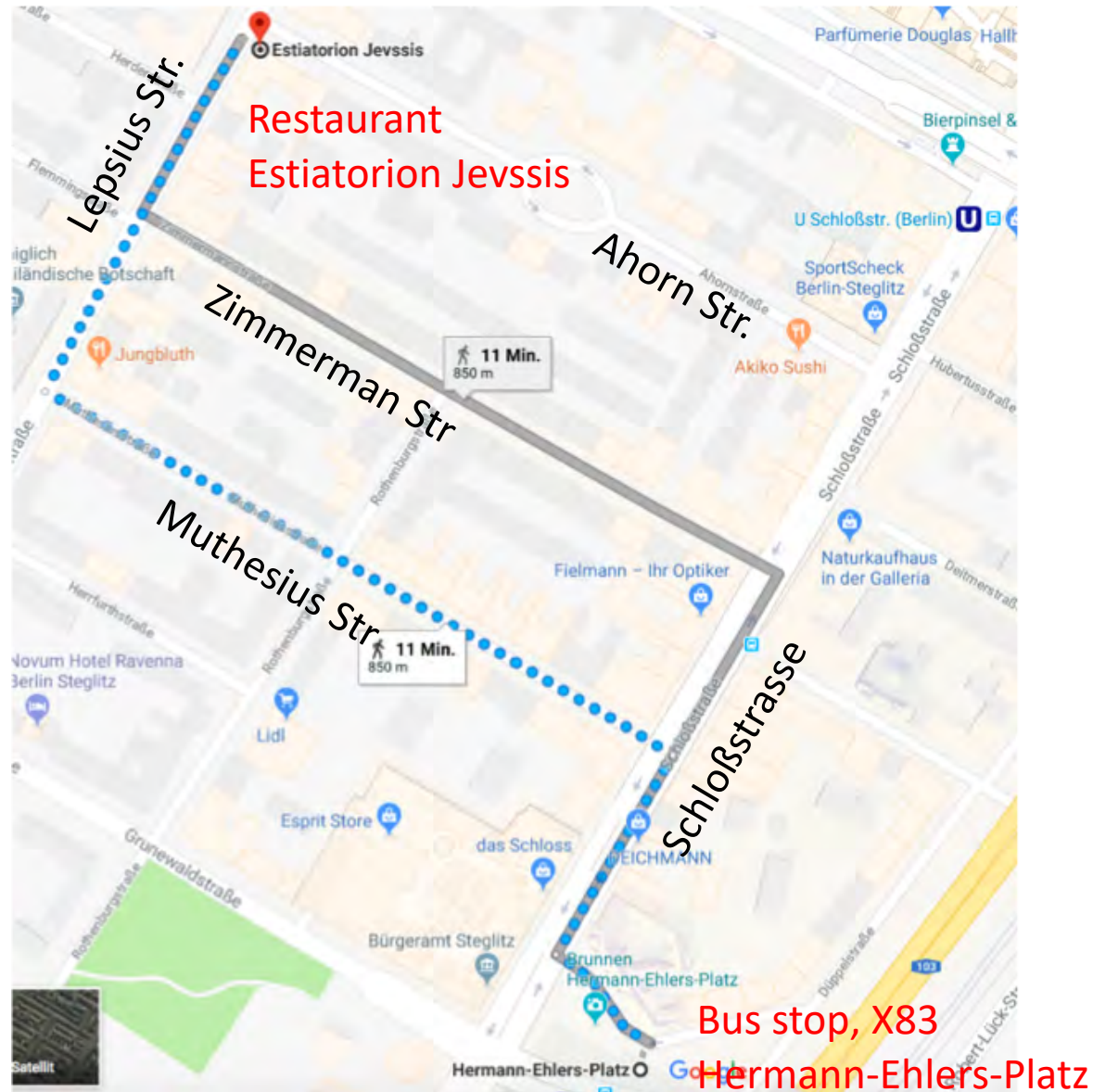
11:15-11:45 Coffee

Friday morning, Feb. 2nd, 2018



- 11:45-12:15 Christian Haberland (GFZ-Potsdam) *Local EQ Tomography*
- 12:30-13:00 Edi Kissling (ETHZ) *Targeting and interpreting major structures with seismological methods*
- 13:00--13:15 *Final discussion and open questions*
- 13:15-13:30 Mark Handy (FU-Berlin) - *Wrapup*

Dinner venue

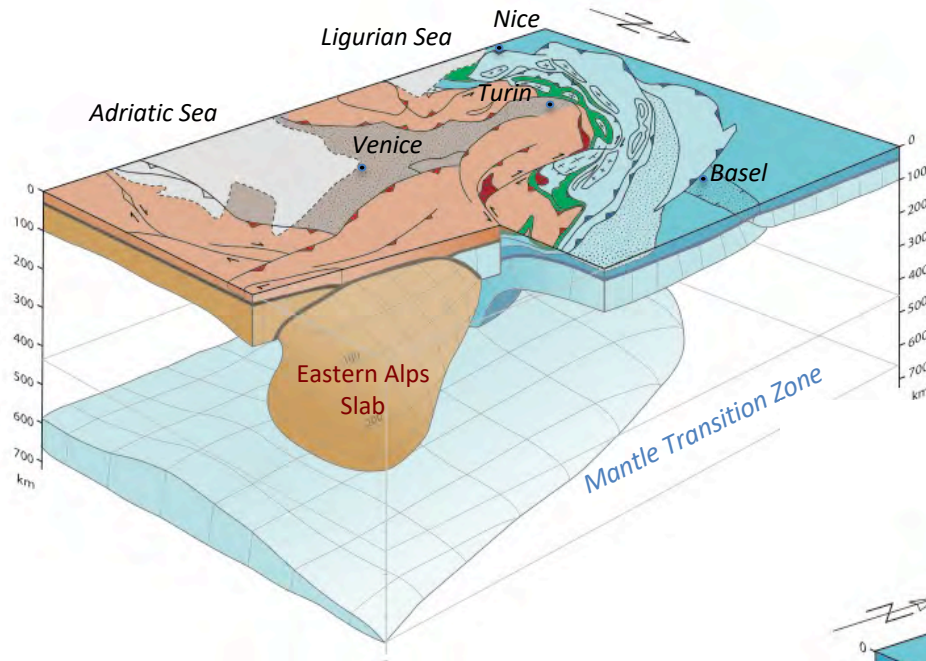


Final remarks

- Thanks to staff and students of the FU-Berlin for the excellent organisation: Juliane Rohlmann, Martina Grundmann, PhDs Marc Grund and Phillip Gross, Tutor Julia Fiedler
- Please return your plastic name tags
- Video recordings will be available
- Next year's Short Course – Tectonics of the Alpine chains

Appendix

3D views down to the mantle transition zone



Sources	
Slabs	Lippitsch et al. 2003
MTZ	Lombardi et al. 2009
Moho	Spada et al. 2013
Geology	Bigi et al. 1989, Schmid et al. 2004

