

Regional Tectonics and Seismic Hazard of Southern Alaska

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State of Alaska

Division of Geological & Geophysical Surveys

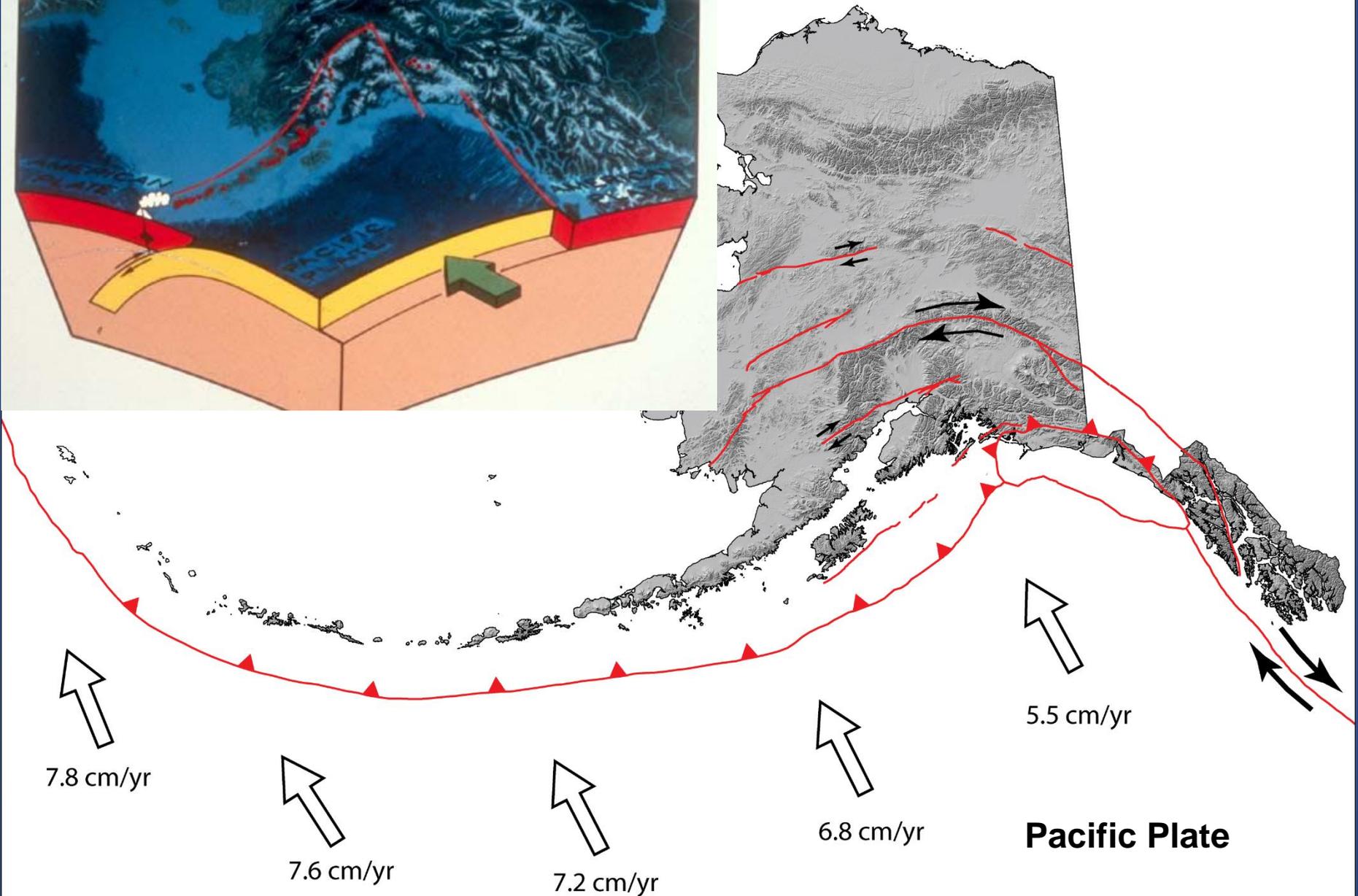
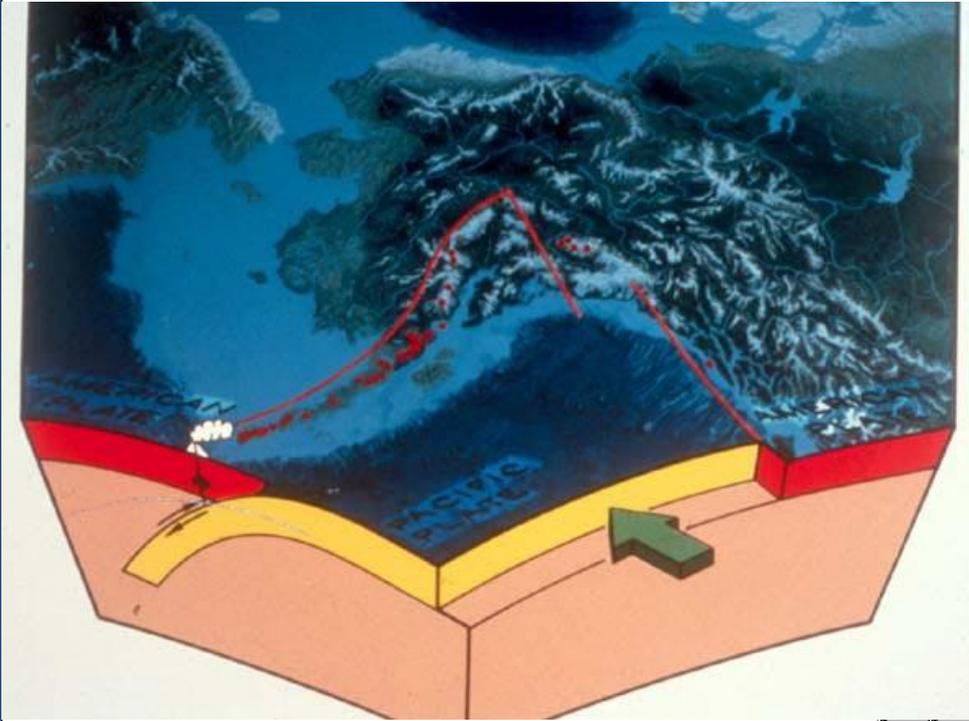
ASHSC Mtg, Anchorage, AK

May 16-17, 2019



Outline

- Tectonic overview of Alaska
- Regional (Probabilistic) Seismic Hazard Assessments
- 30 November 2018 Mw 7.1



7.8 cm/yr

7.6 cm/yr

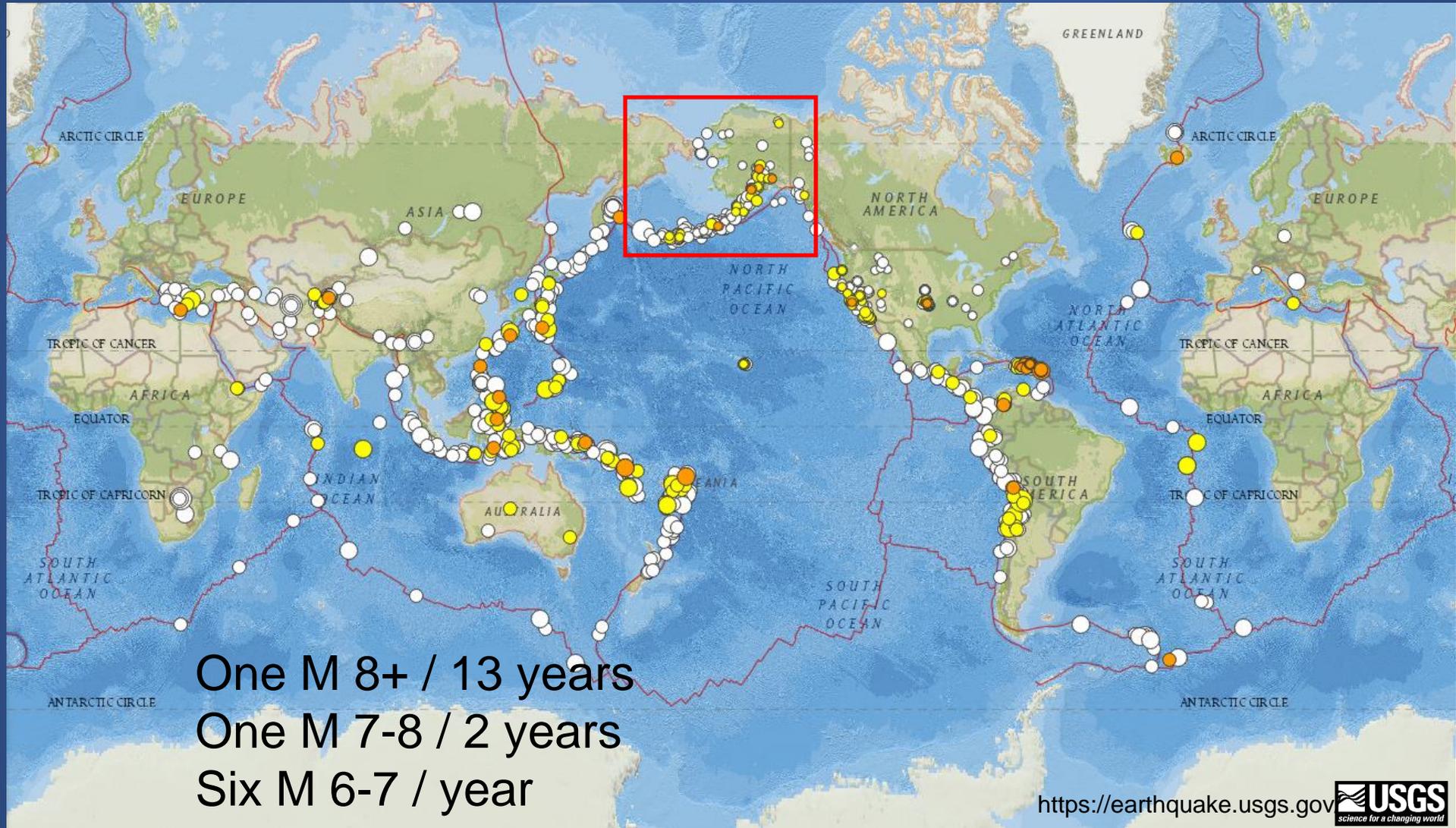
7.2 cm/yr

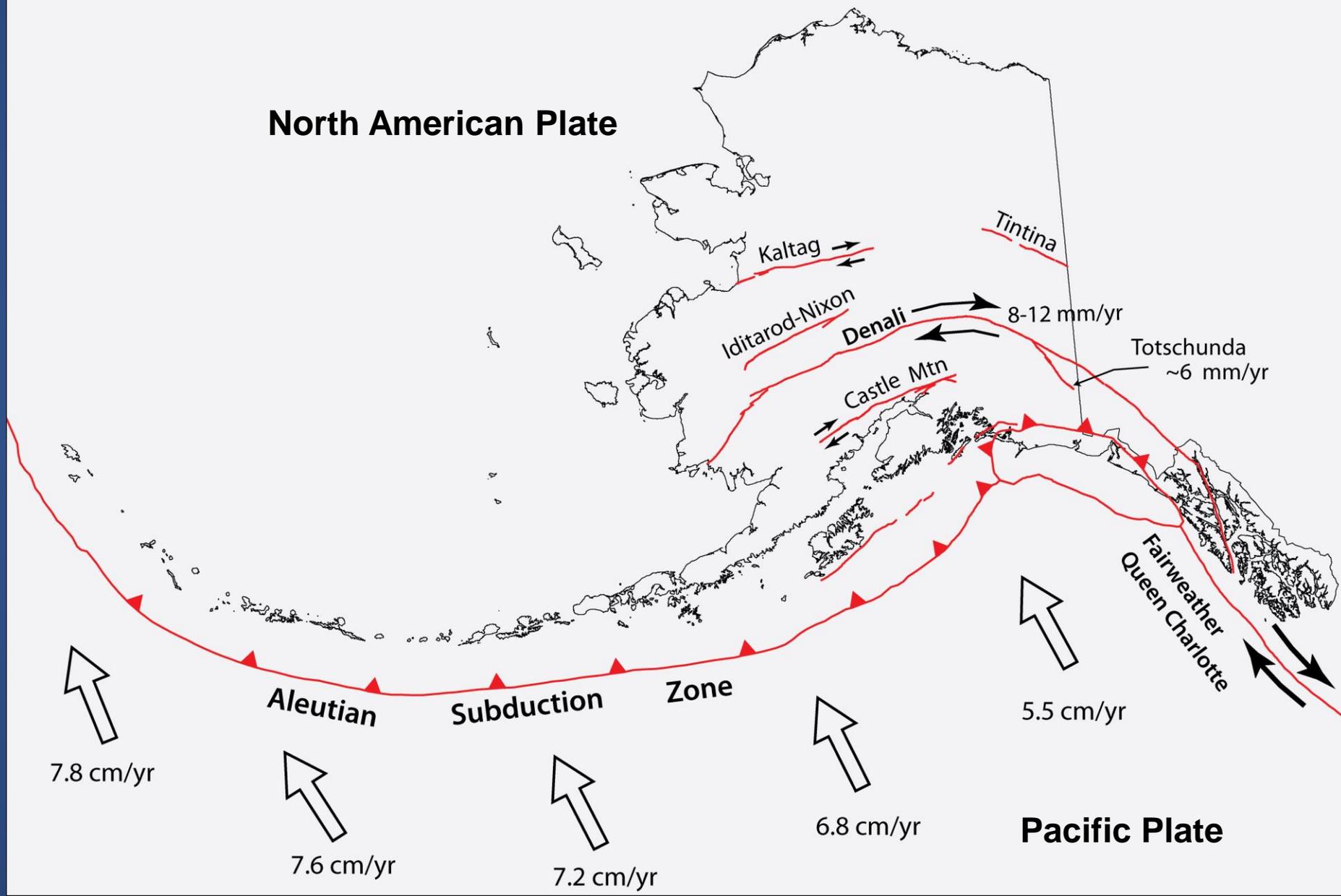
6.8 cm/yr

5.5 cm/yr

Pacific Plate

Magnitude 2.5+, 30 days





North American Plate

Kaltag →

Tintina

Iditarod-Nixon →

Denali →

8-12 mm/yr

Totschunda
~6 mm/yr

Castle Mtn →

Fairweather
Queen Charlotte →

Aleutian Subduction Zone



7.8 cm/yr



7.6 cm/yr



7.2 cm/yr

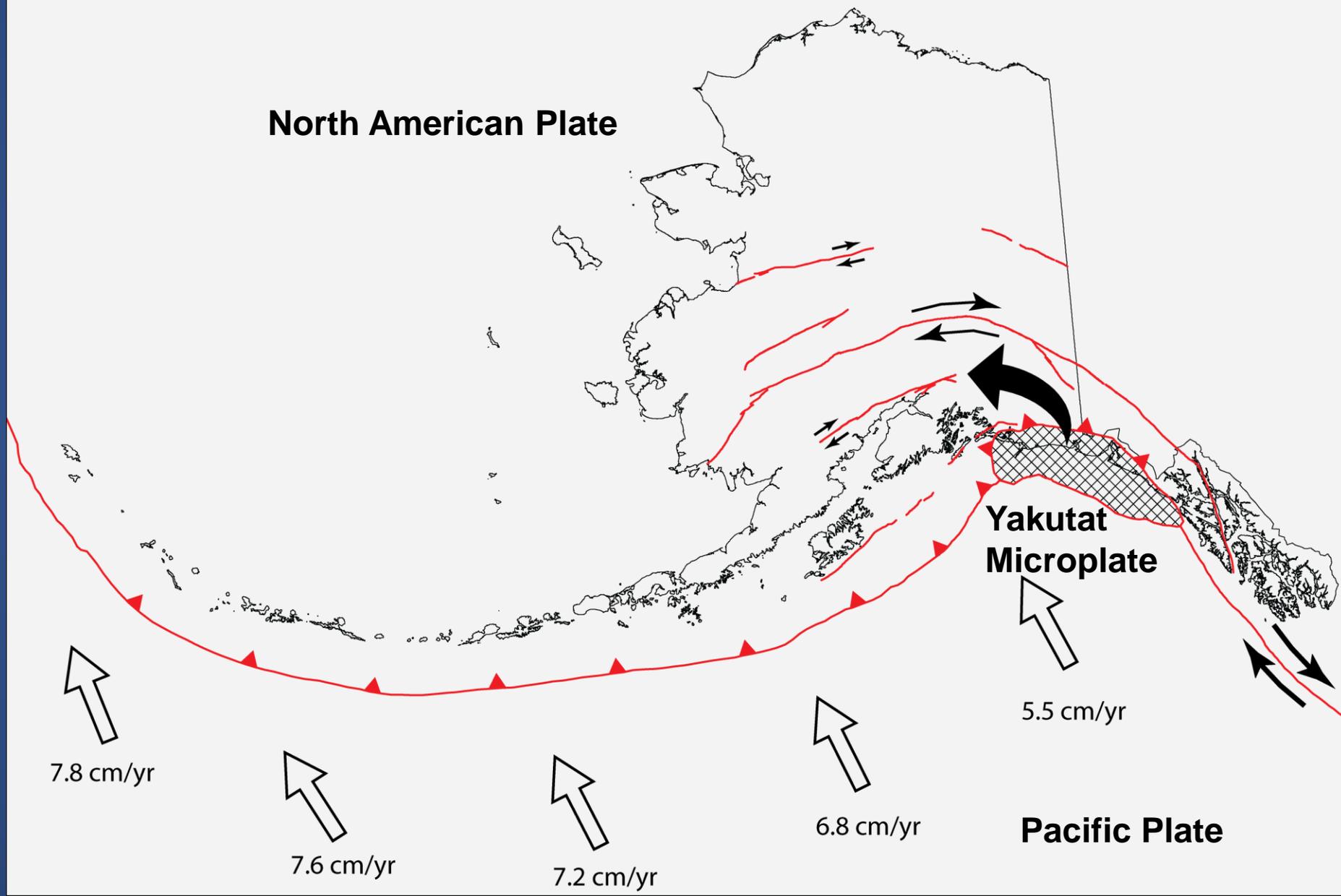


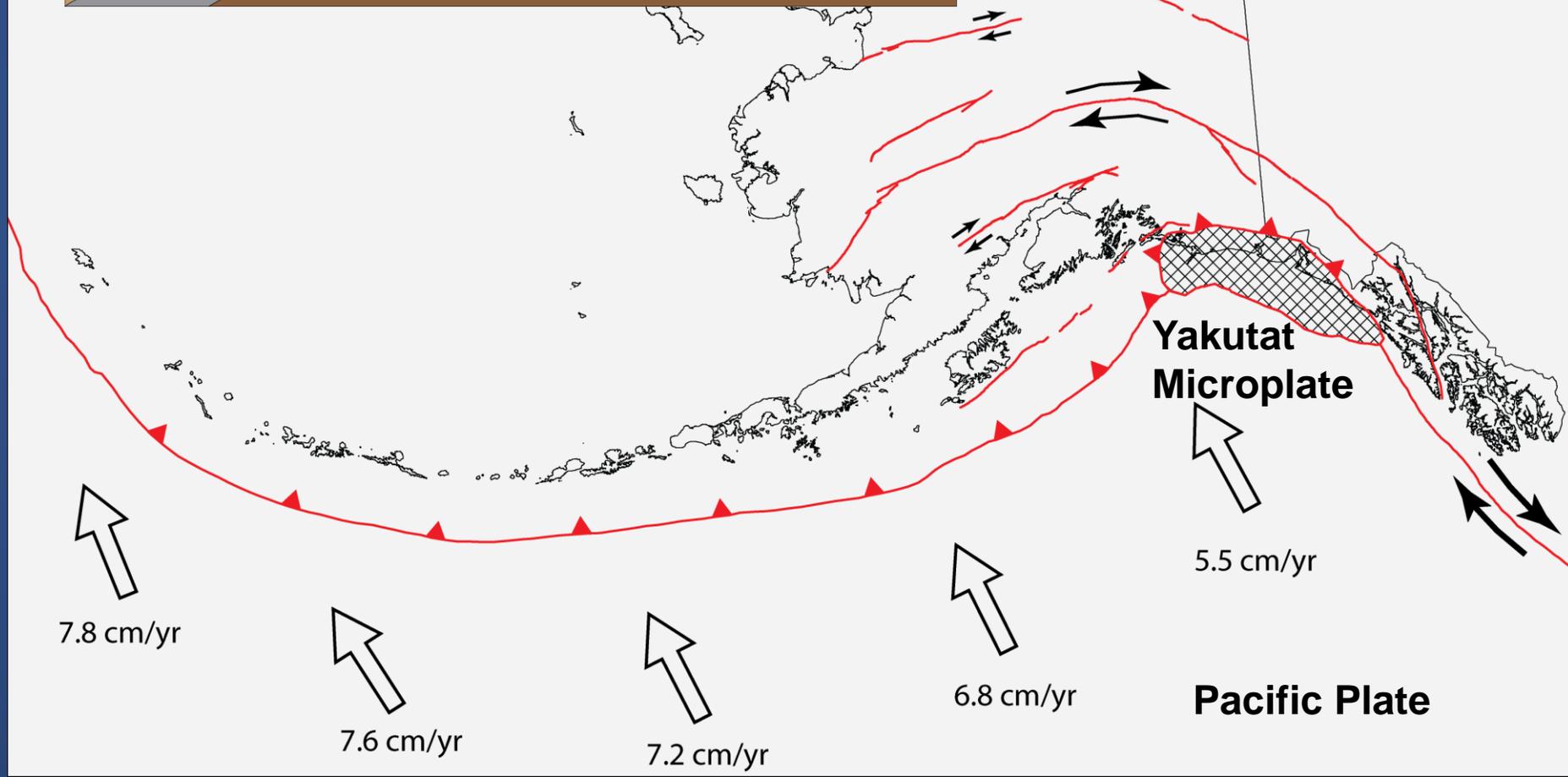
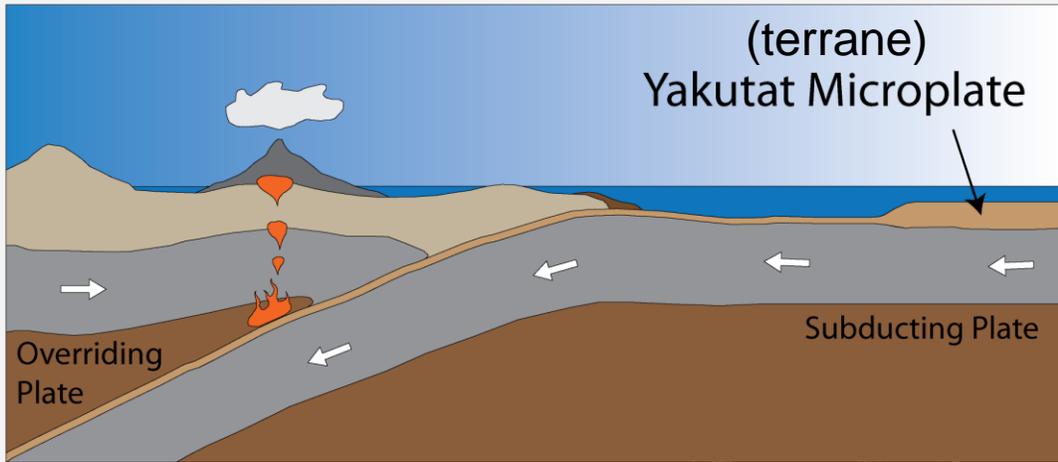
6.8 cm/yr

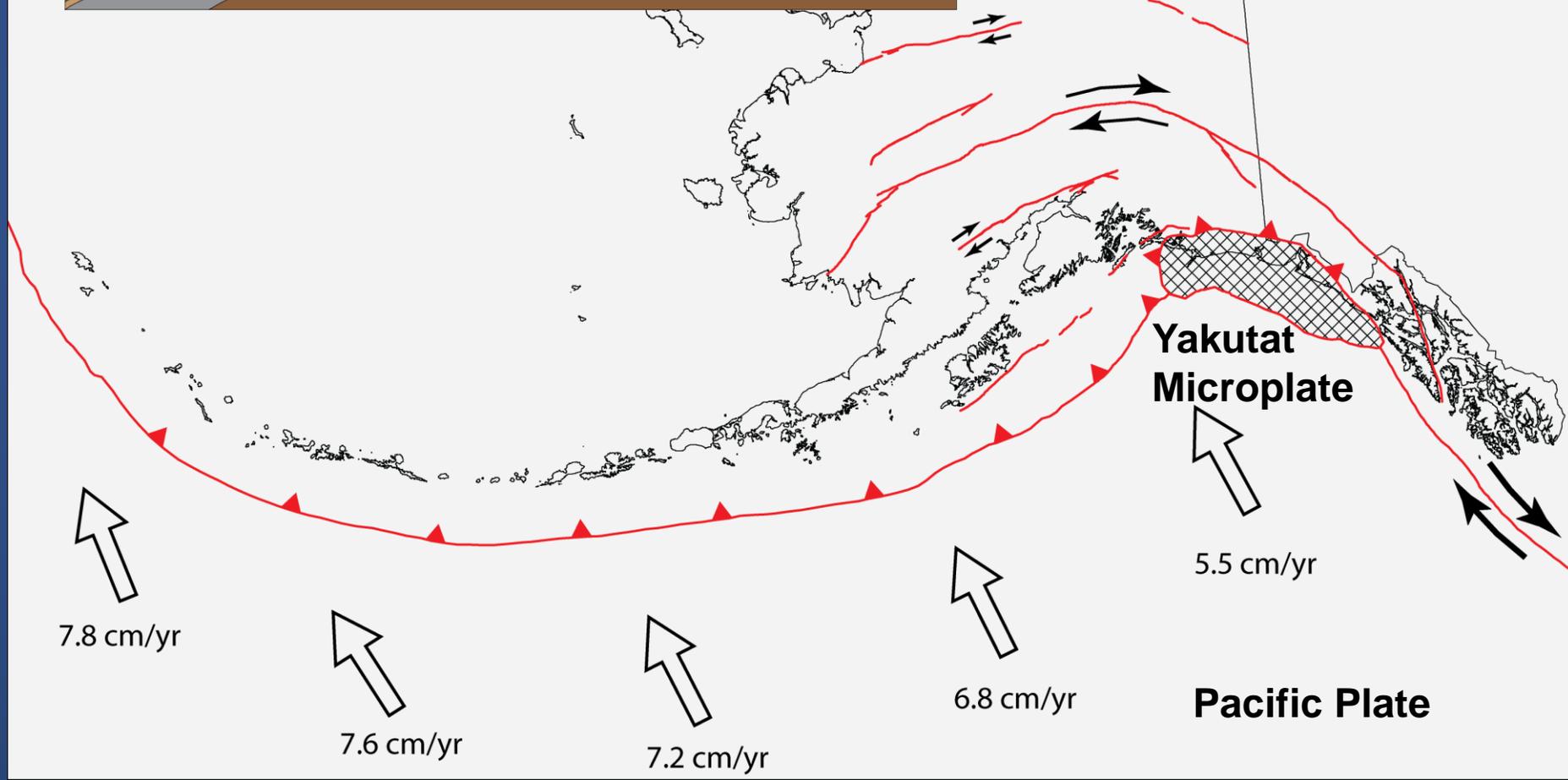
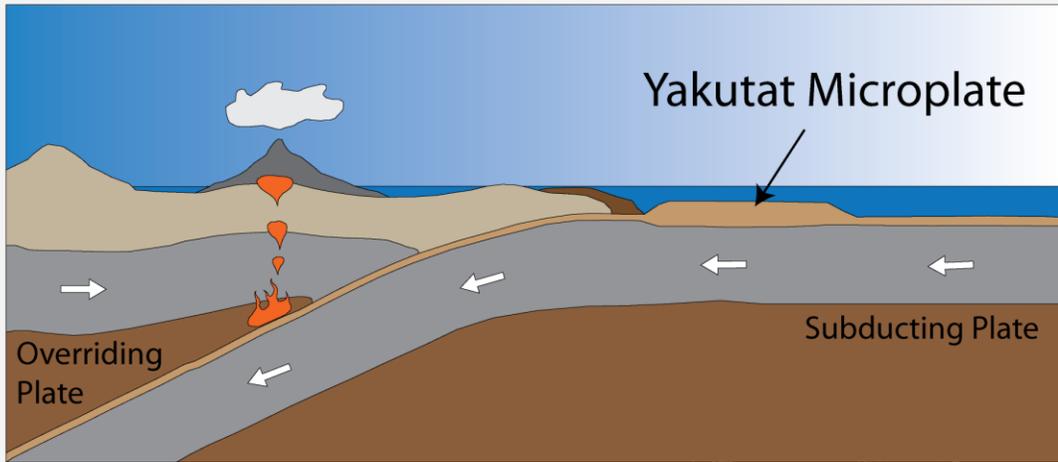


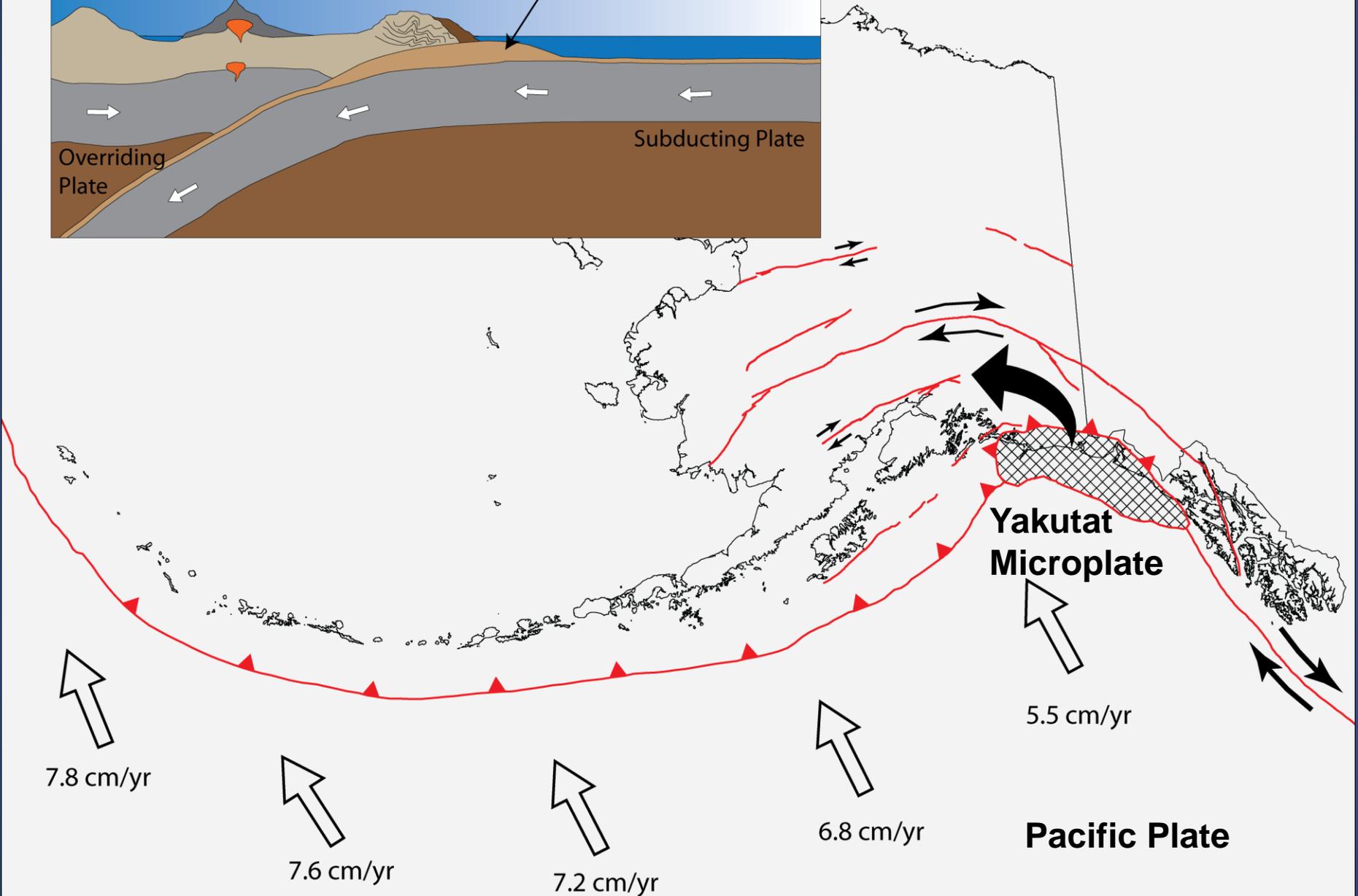
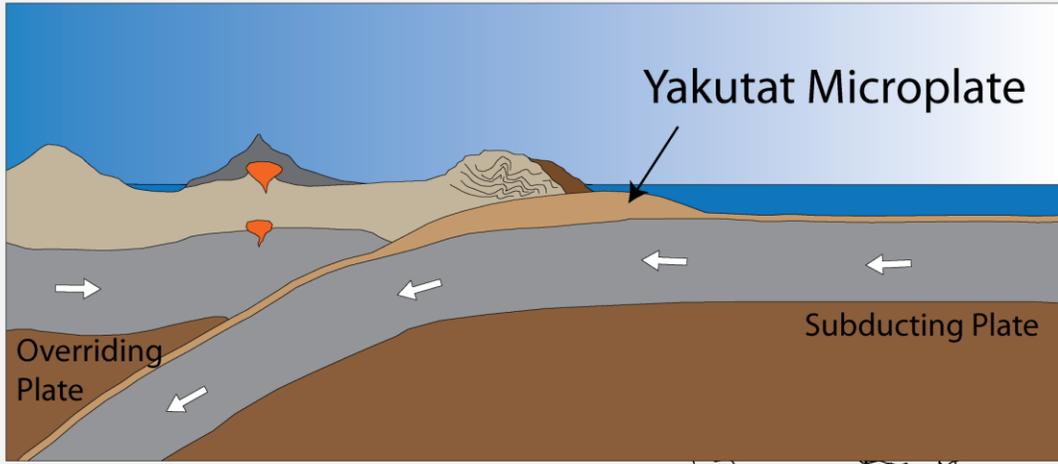
5.5 cm/yr

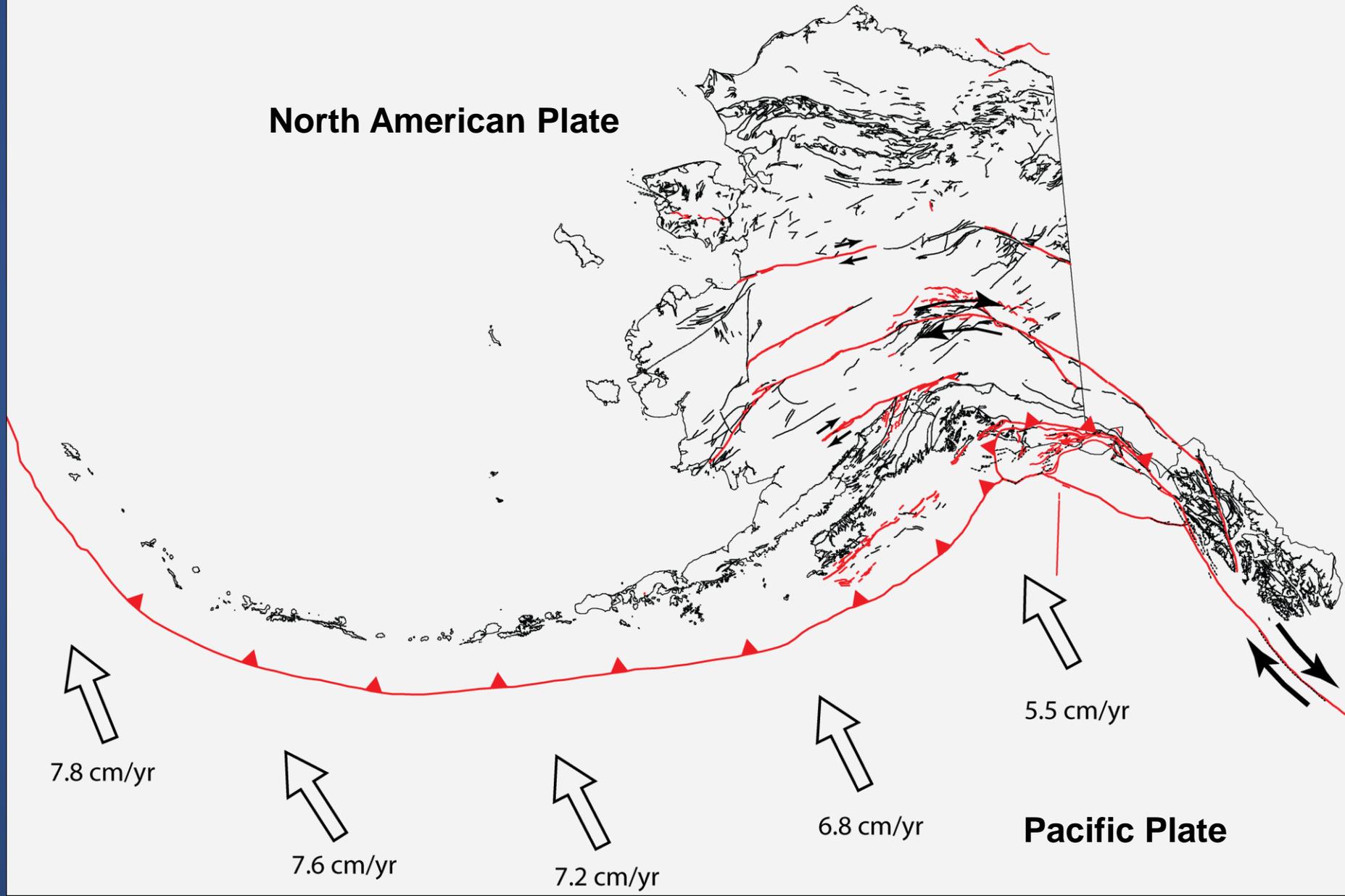
Pacific Plate

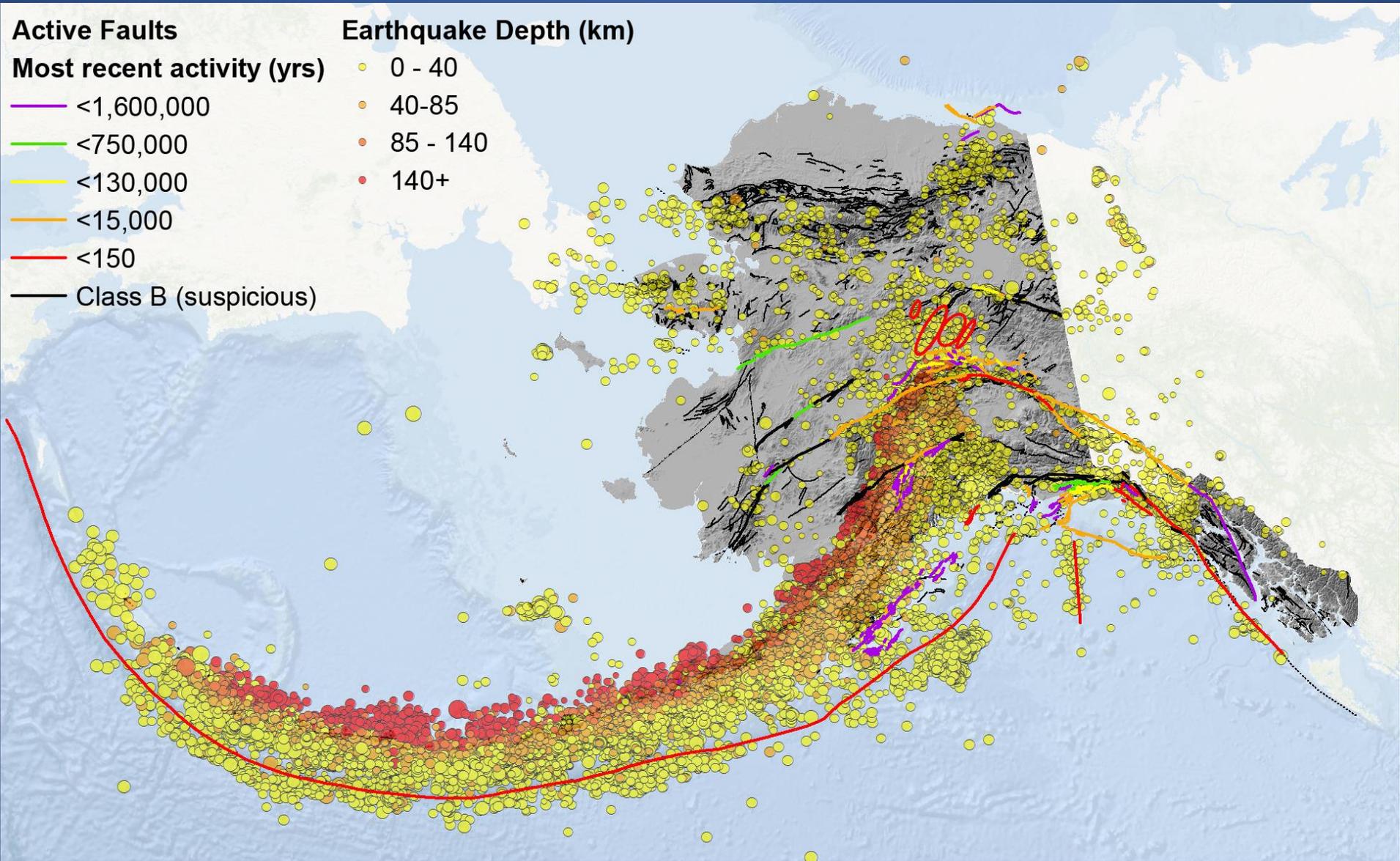




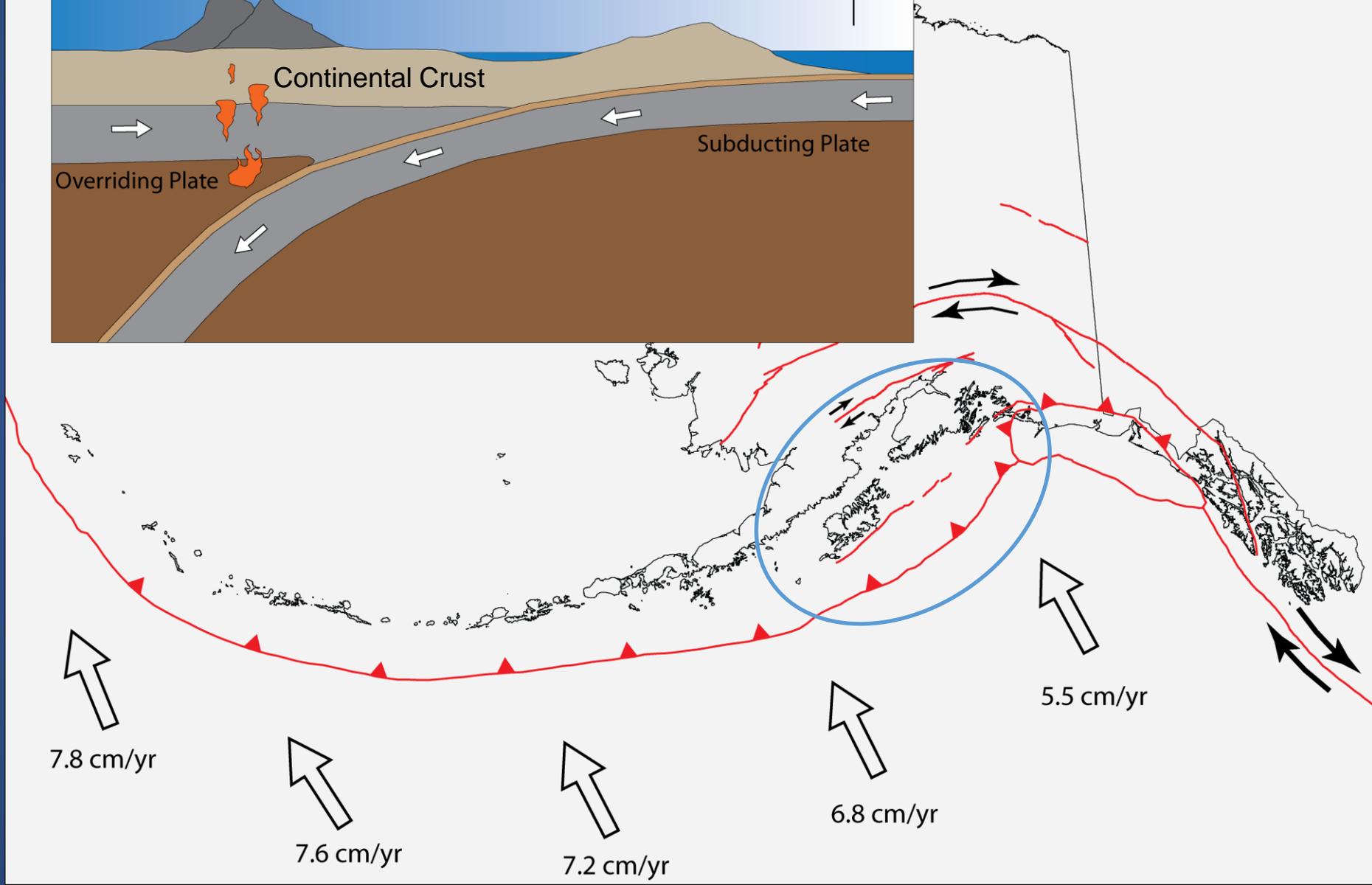
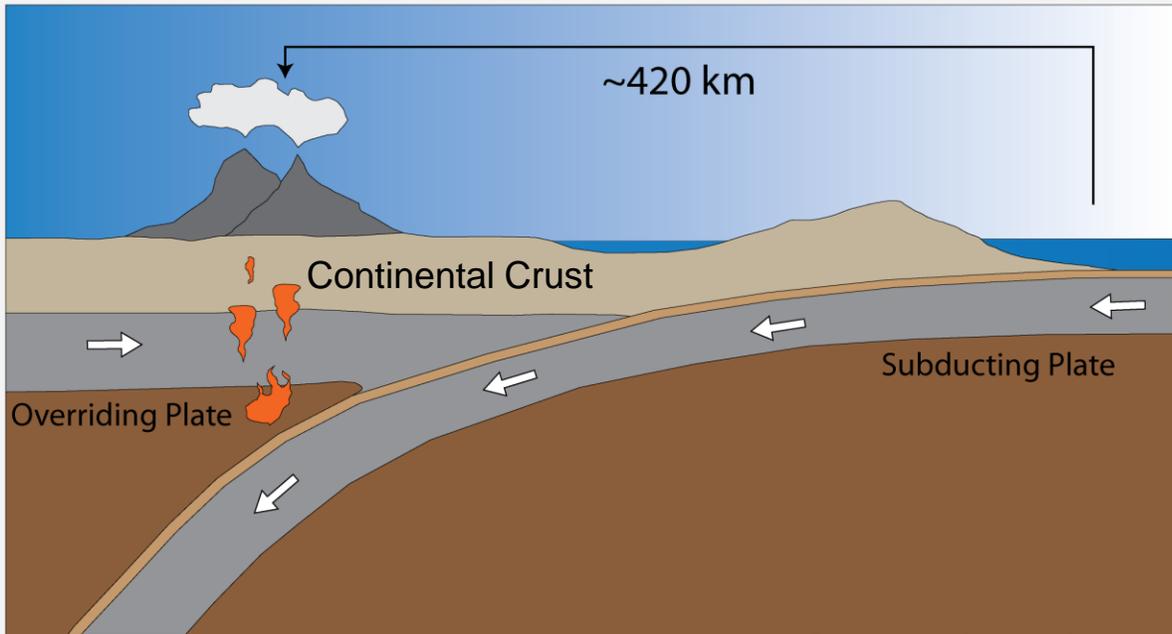




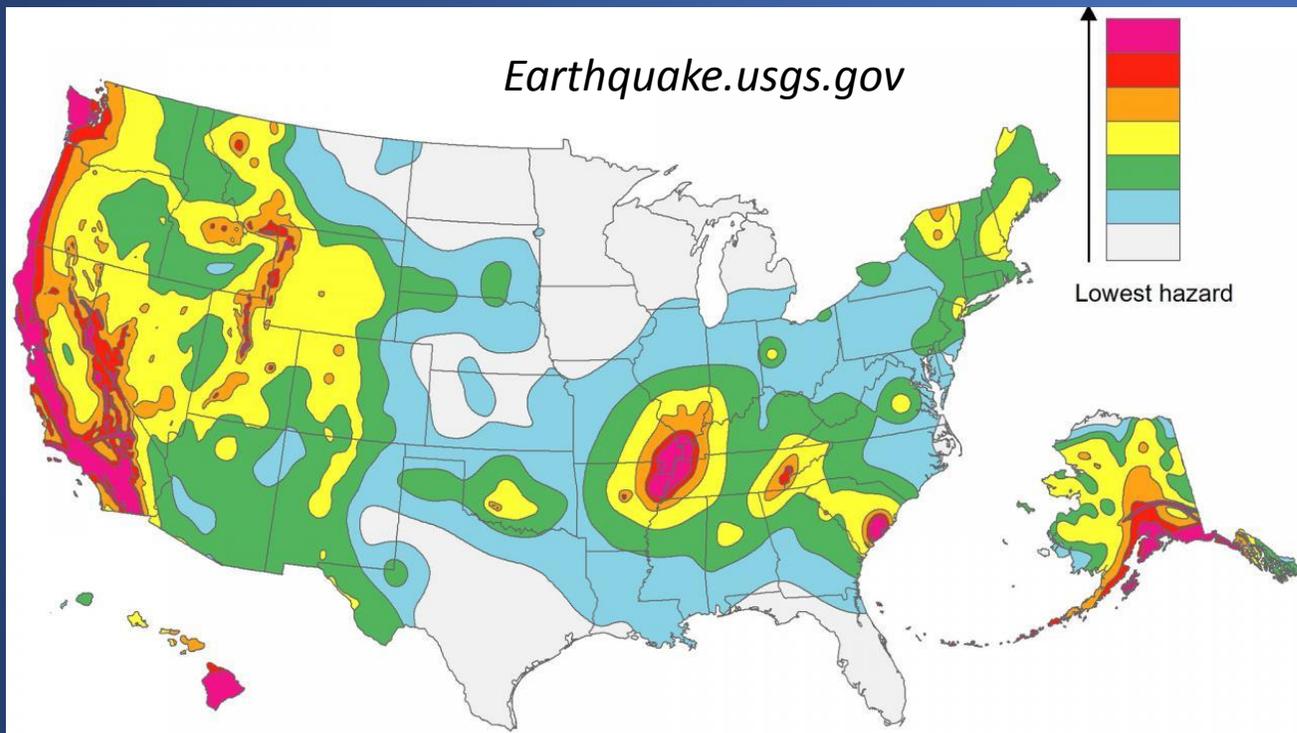




All magnitude 2 or greater earthquakes, 2014-2018



Probabilistic Seismic Hazard Assessments (PSHA)



- Past significant/insignificant EQ's
- Historical shaking intensities
- *Rates* of seismicity
- Model of EQ recurrence based on prehistoric info (from geologic studies)

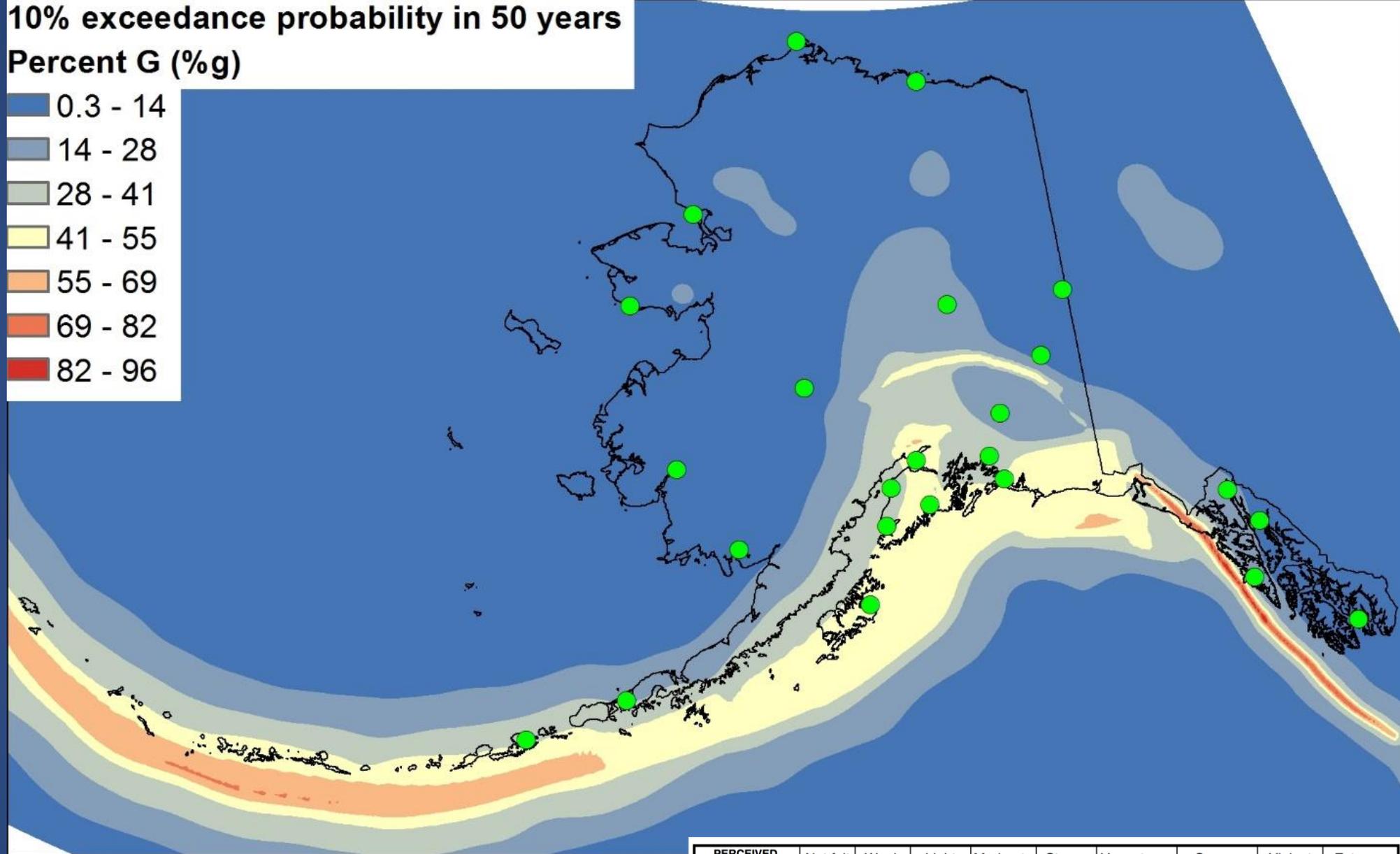
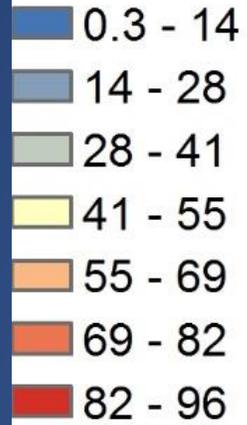
With a model of ALL potential future EQ's...

- A 10% chance in 50 years = an AEP of 0.21%, avg return period 476 yrs
- A 5% chance in 50 years = an AEP of 0.1025%, avg return period 976 yrs
- A 2% chance in 50 years = an AEP of 0.0404%, average return period 2,476 yrs

- ASSUMPTIONS: attenuation relationships, geologic substrate

10% exceedance probability in 50 years

Percent G (%g)



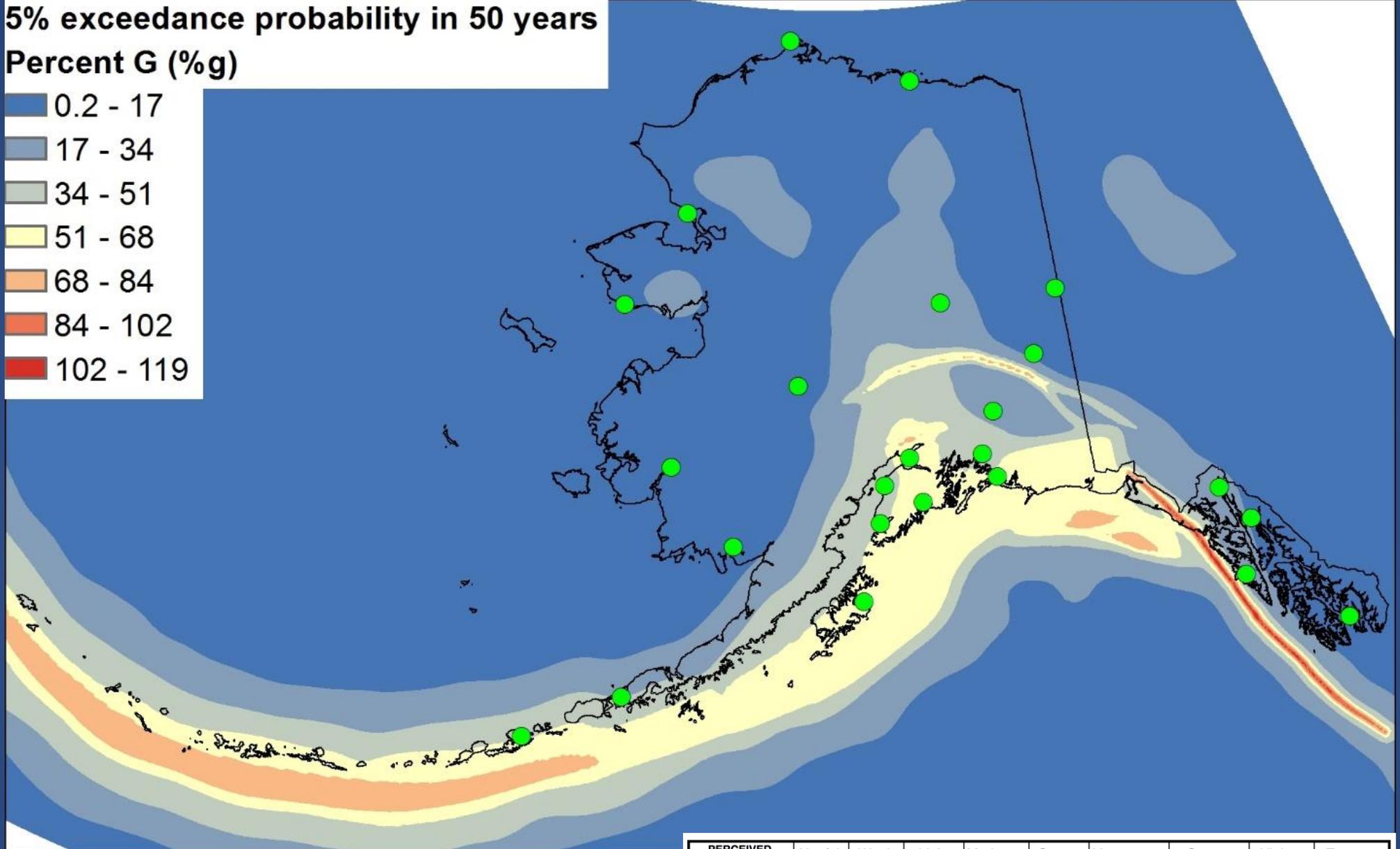
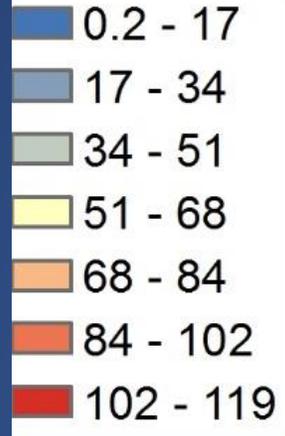
an AEP of 0.21%, avg return period 476 yrs

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC. (%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL. (cm/s)	<0.02	0.1	1.4	4.7	9.6	20	41	86	>178
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2012)

5% exceedance probability in 50 years

Percent G (%g)



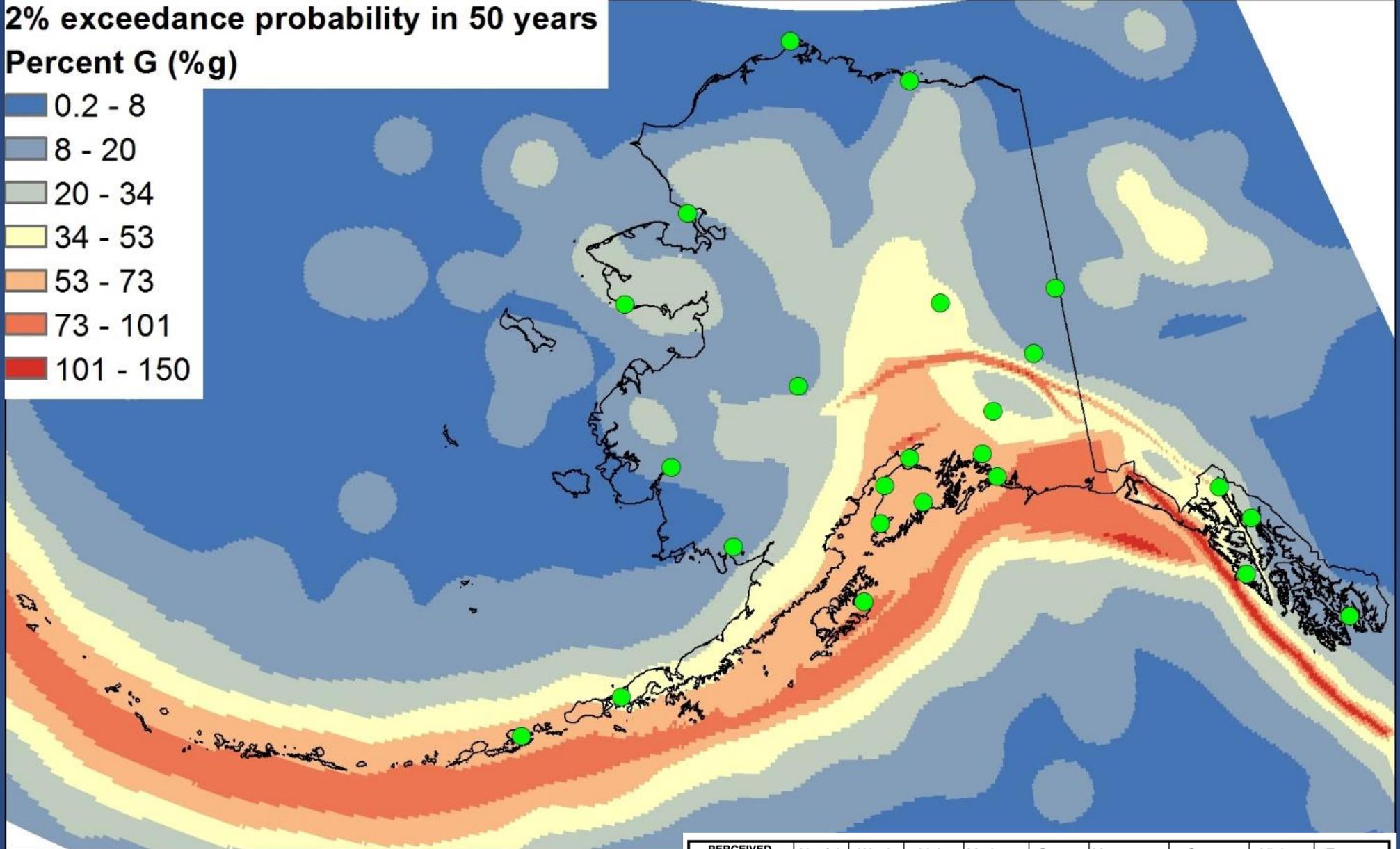
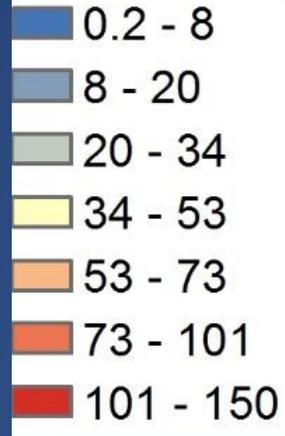
an AEP of 0.1025%, avg return period 976 yrs

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC. (%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
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INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2012)

2% exceedance probability in 50 years

Percent G (%g)



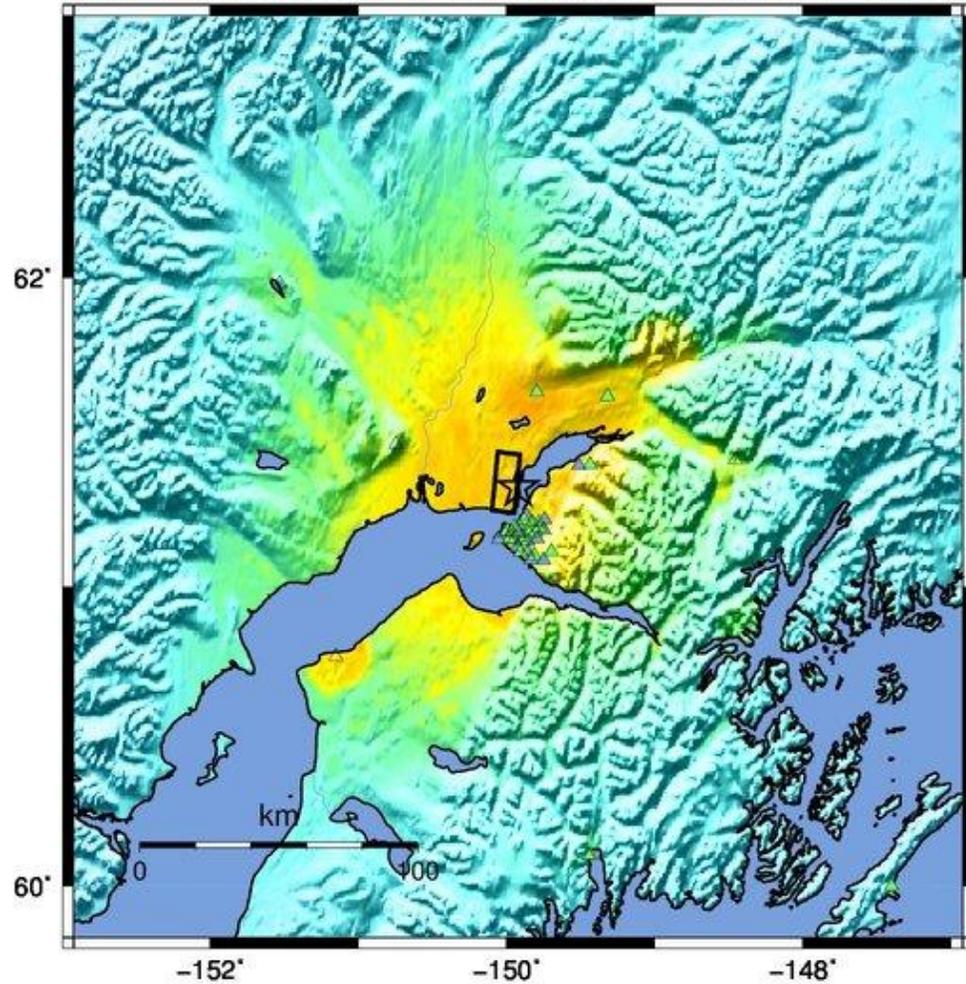
an AEP of 0.0404%, average return period 2,476 yrs

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	<0.02	0.1	1.4	4.7	9.6	20	41	86	>178
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2012)

AEC ShakeMap : 7 miles NW of Elmendorf AFB

Nov 30, 2018 08:29:29 AM AKST M 7.0 N61.32 W149.92 Depth: 44.1km ID:20419010



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	<0.02	0.1	1.4	4.7	9.6	20	41	86	>178
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X _s

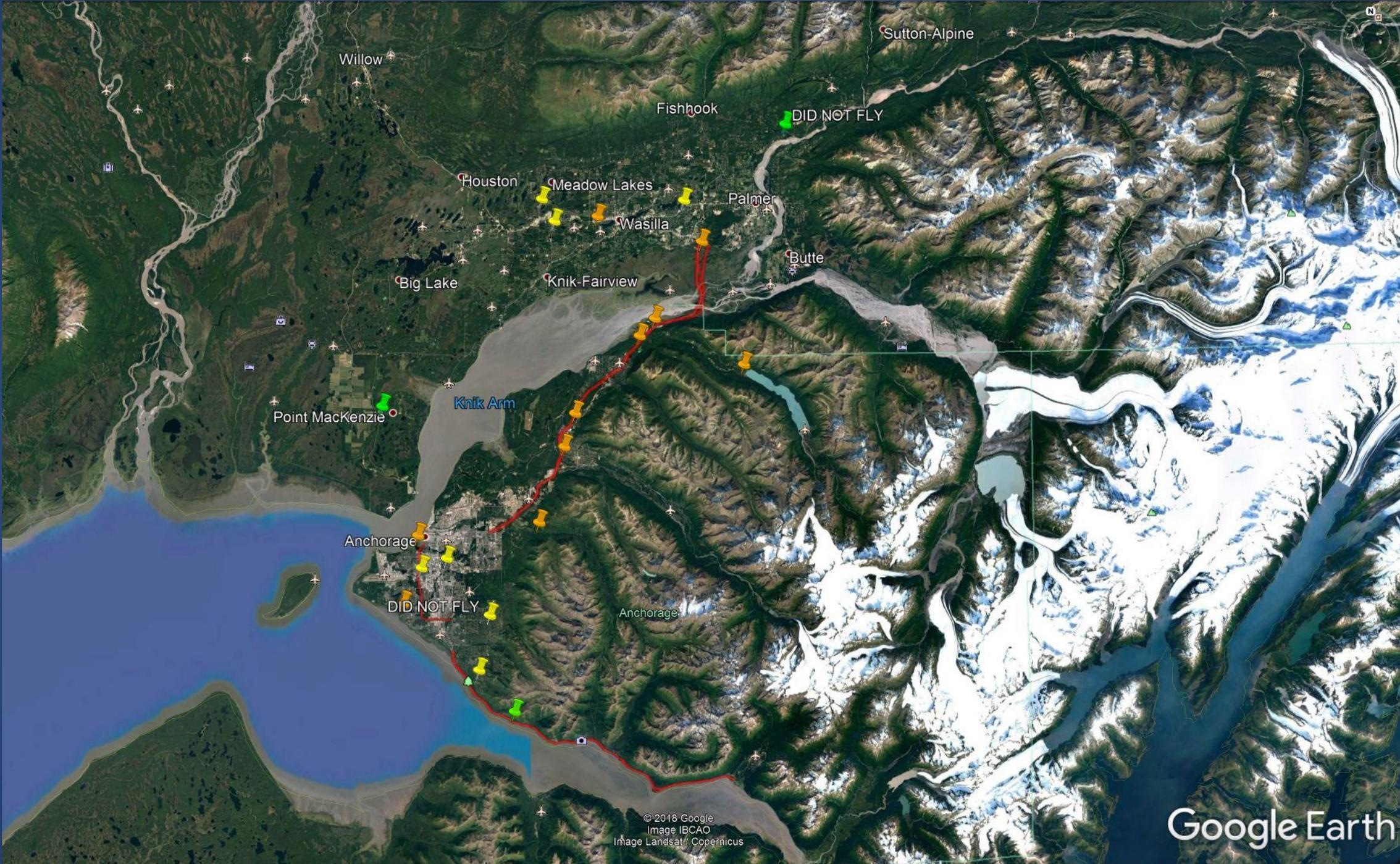
Scale based upon Worden et al. (2012)

Table 1. Peak ground accelerations at selected stations operated by the USGS, and the AEC.

geerassociation.org

Station ID	Station Name	Latitude	Longitude	Epicentral Distance (Km)	PGA HNN (g)	PGA HNE (g)	Visited by GEER team
K223	AK:Anchorage;Gvt Hill Elem Sch	61.2338	-149.8675	12.4	0.180	0.269	Y
2716	AK:Anchorage;Hilton Hotel	61.2190	-149.8920	13.7	0.214	0.208	Y
8038	AK:Anchorage;FS 01 (Central)	61.2184	-149.8829	13.9	0.254	0.293	Y
8040	Anchorage - R B Atwood Bldg	61.2150	-149.8930	14.3	0.208	0.208	Y
8016	AK:Anchorage;BP Bld	61.1920	-149.8640	16.9	0.283	0.283	Y
8042	AK:Anchorage;Frontier Bld	61.1880	-149.8840	17.2	0.193	0.193	N
8036	AK:Anchorage;DOI OAS	61.1779	-149.9657	18.1	0.392	0.276	Y
8047	AK:Anchorage;USGS ESC	61.1890	-149.8020	18.3	-	-	Y
8030	Anchorage - Police HQ	61.1795	-149.8058	19.3	0.290	0.227	Y
8027	AK:Anchorage;St Fish&Game	61.1609	-149.8894	20.1	0.193	0.472	Y
8037	Anchorage - NOAA Weather Fac	61.1563	-149.9850	20.7	0.361	0.277	Y
8021	AK:Anchorage;Klatt Elem Sch	61.1129	-149.9095	25.4	0.113	0.123	Y
2738	AK:Cantwell;ADOT Maint Sta	63.3890	-148.8850	234.8	0.125	0.125	N
2767	AK:Fairbanks;Moose Creek Dam	64.7930	-147.1810	410.8	--	--	N





Willow

Sutton-Alpine

Fishhook

DID NOT FLY

Houston

Meadow Lakes

Palmer

Wasilla

Butte

Big Lake

Knik-Fairview

Knik Arm

Point MacKenzie

Anchorage

DID NOT FLY

Anchorage

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Google Earth

61°42'06.31" N 150°54'21.76" W elev 190 ft eye alt 99.25 mi