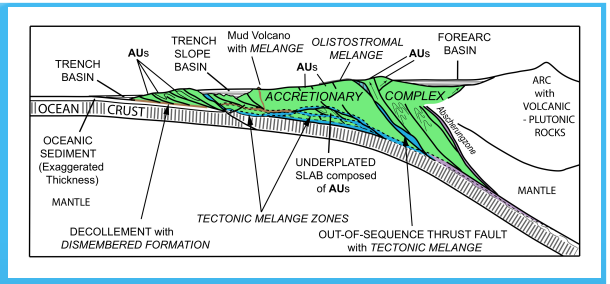

EVALUATING SUBDUCTION ACCRETIONARY COMPLEX ARCHITECTURE AND HISTORY: ACCRETIONARY UNIT TYPES FROM THE FRANCISCAN AND MIURA-BOSO COMPLEXES

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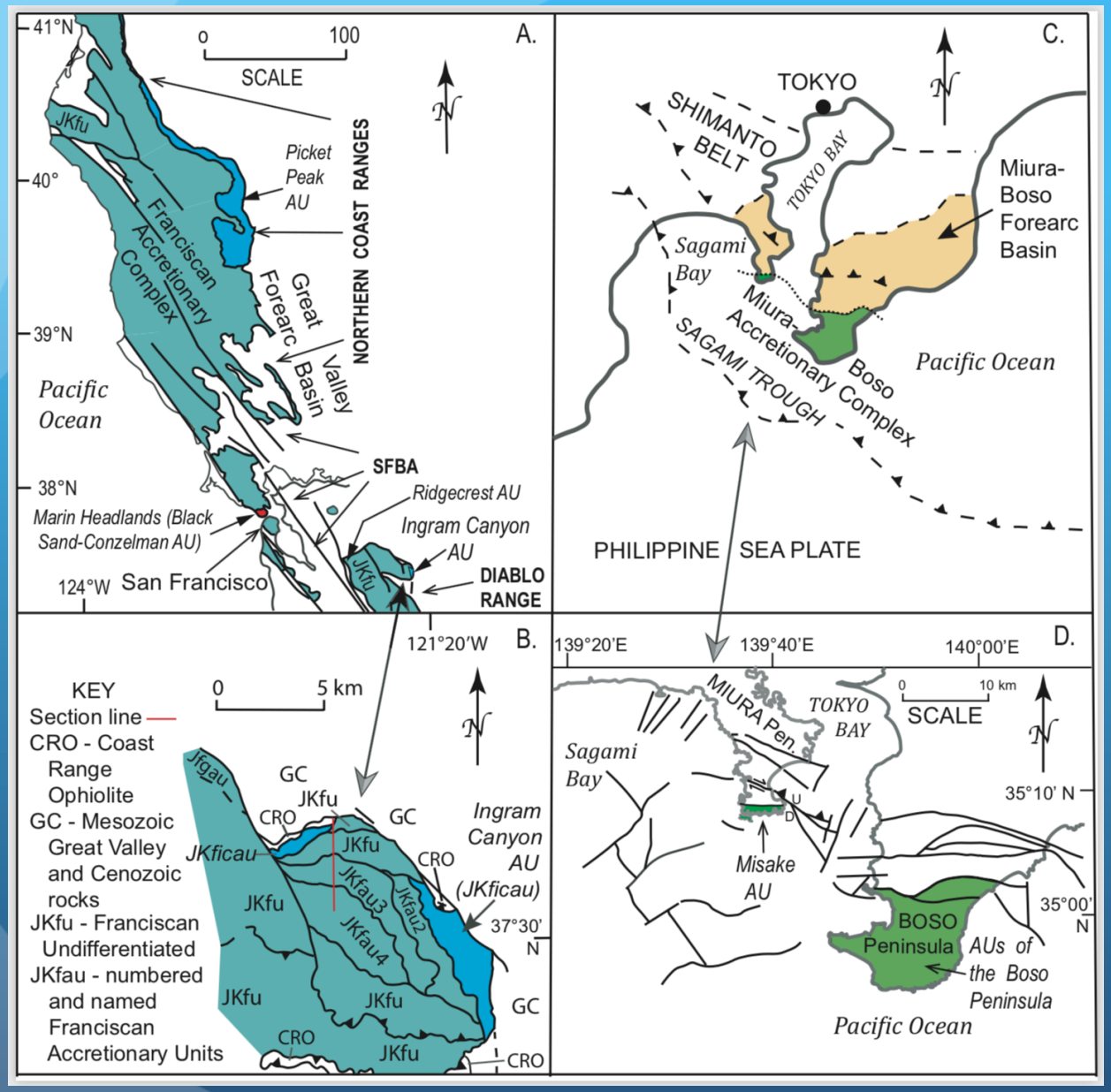
Major Points

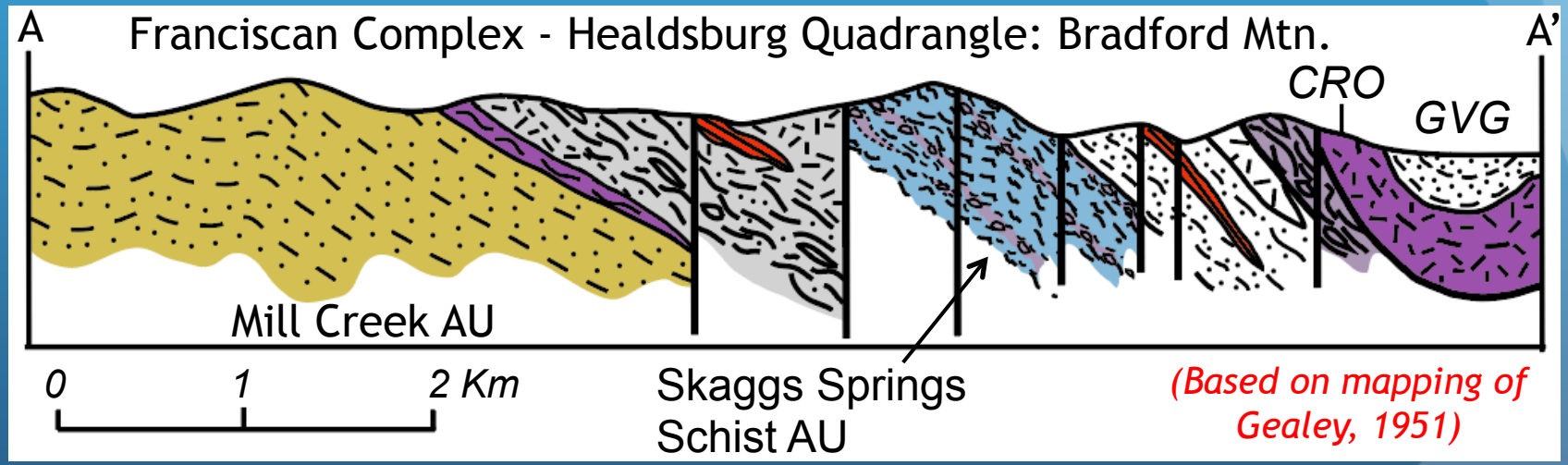
- Subduction accretionary complexes (SACs) consist of major tectonostratigraphic units called accretionary units (AUs).
- AUs are bounded by significant faults that cut internal layers and faults within the AU.
- AUs appear in three basic formats, but may be hybrids with aspects of two or all three formats – sheets, folded masses, and faulted units.
- Post-accretion deformation is common and complicates interpretations of AUs

In this talk, I will use Examples from the Franciscan & Miura-Boso SACs



Maps based on various sources, including for (A) & (B) Raymond 2014, 2017; for (C) & (D) Taira et al. 1992, Ogawa et al. 2003, Japanese Geological Survey Map of the Sagami-Nada Sea.

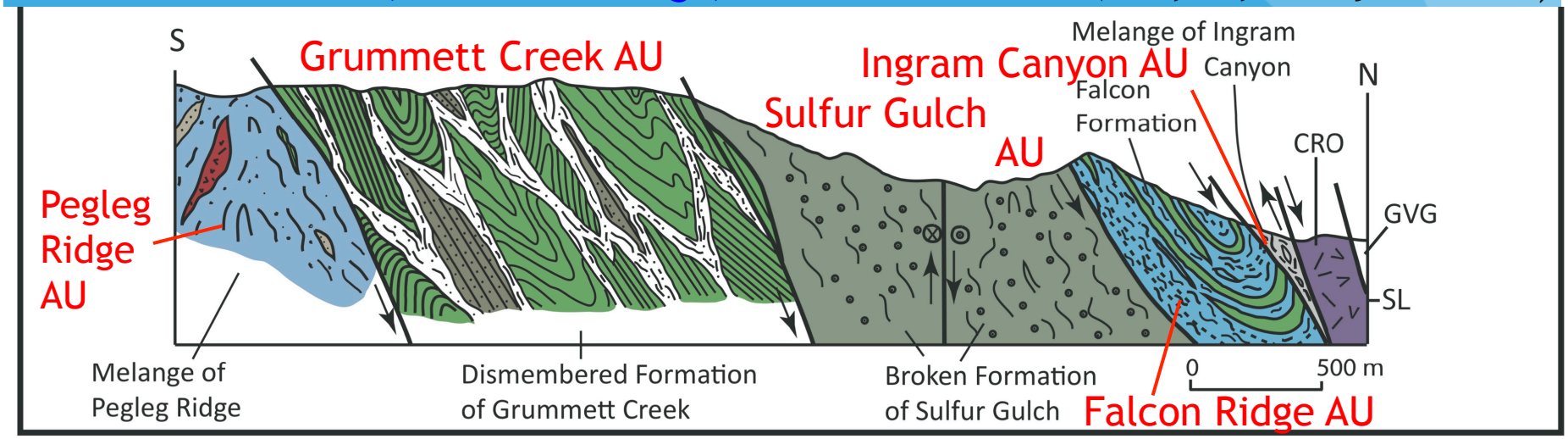
Subduction accretionary complexes (SACs), e.g., the Franciscan Complex of CA & the Miura-Boso SAC of Japan, consist of major and minor structural, stratigraphic, and tectonostratigraphic units.



AUs
The major architectural components of SACs are Accretionary Units (AUs).

Oso Block X-section, NE Diablo Range, CA

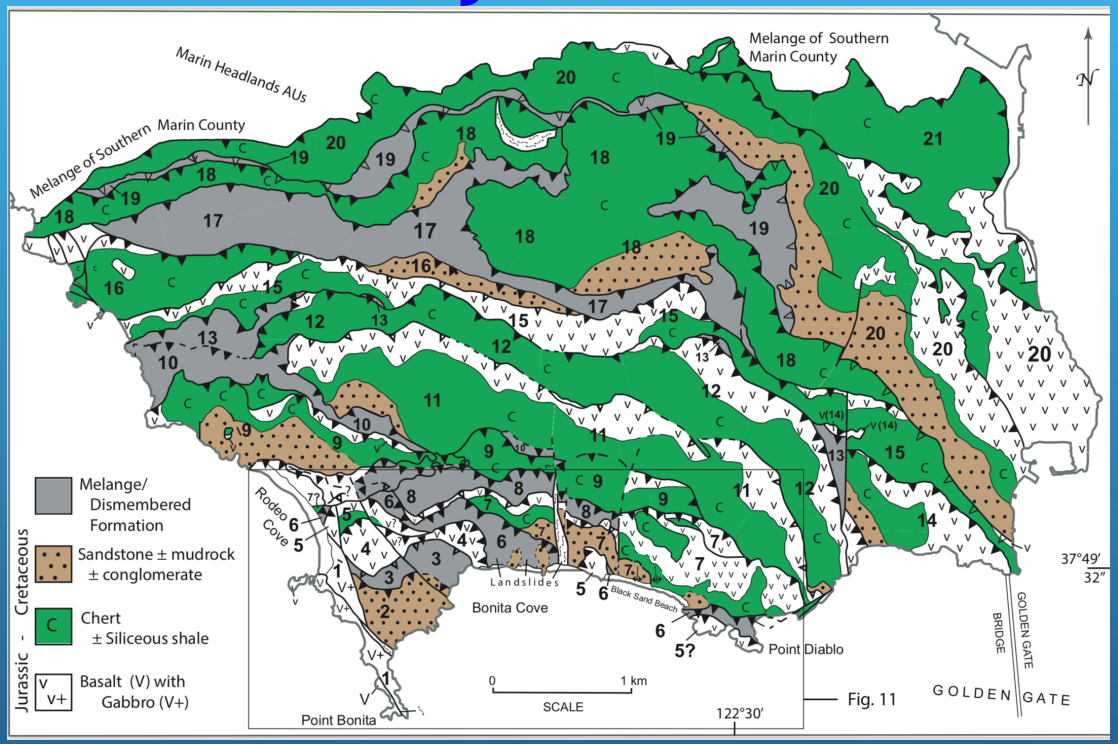
(Modified from Raymond, 1973)

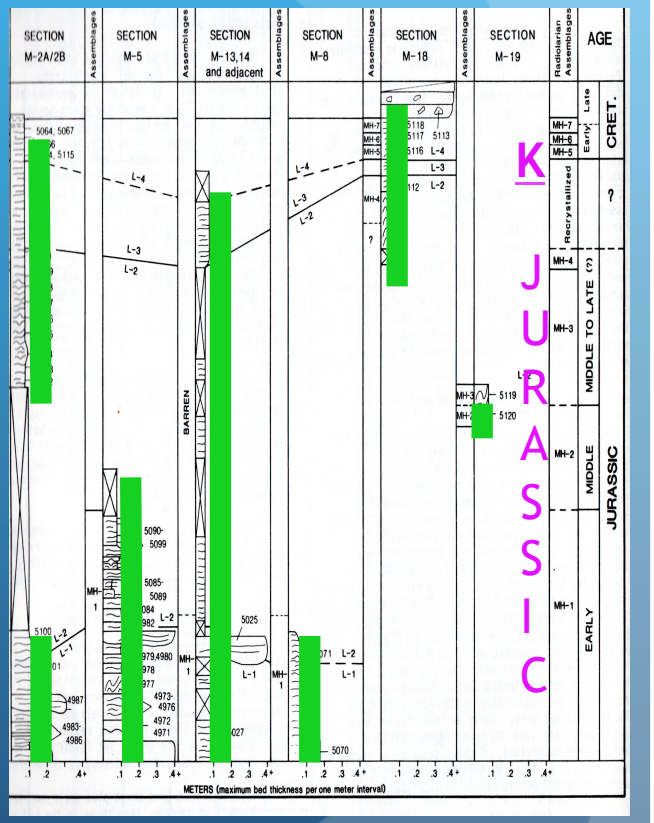


- AUs are basic tectonostratigraphic units bounded by major faults. These AU-bounding faults cut internal contacts and smaller faults within the AU.

AUs differ from terranes in that unlike terranes, they may contain units stratigraphically correlative with units in other major architectural units.

NOTE: Terranes typically contain multiple AUs





Murchey (1984) showed chert correlations within Marin Headlands & Murchey & Jones (1984) extended the correlations to other units.

(Modified from Murchey, 1984)

These other units cannot be terranes.

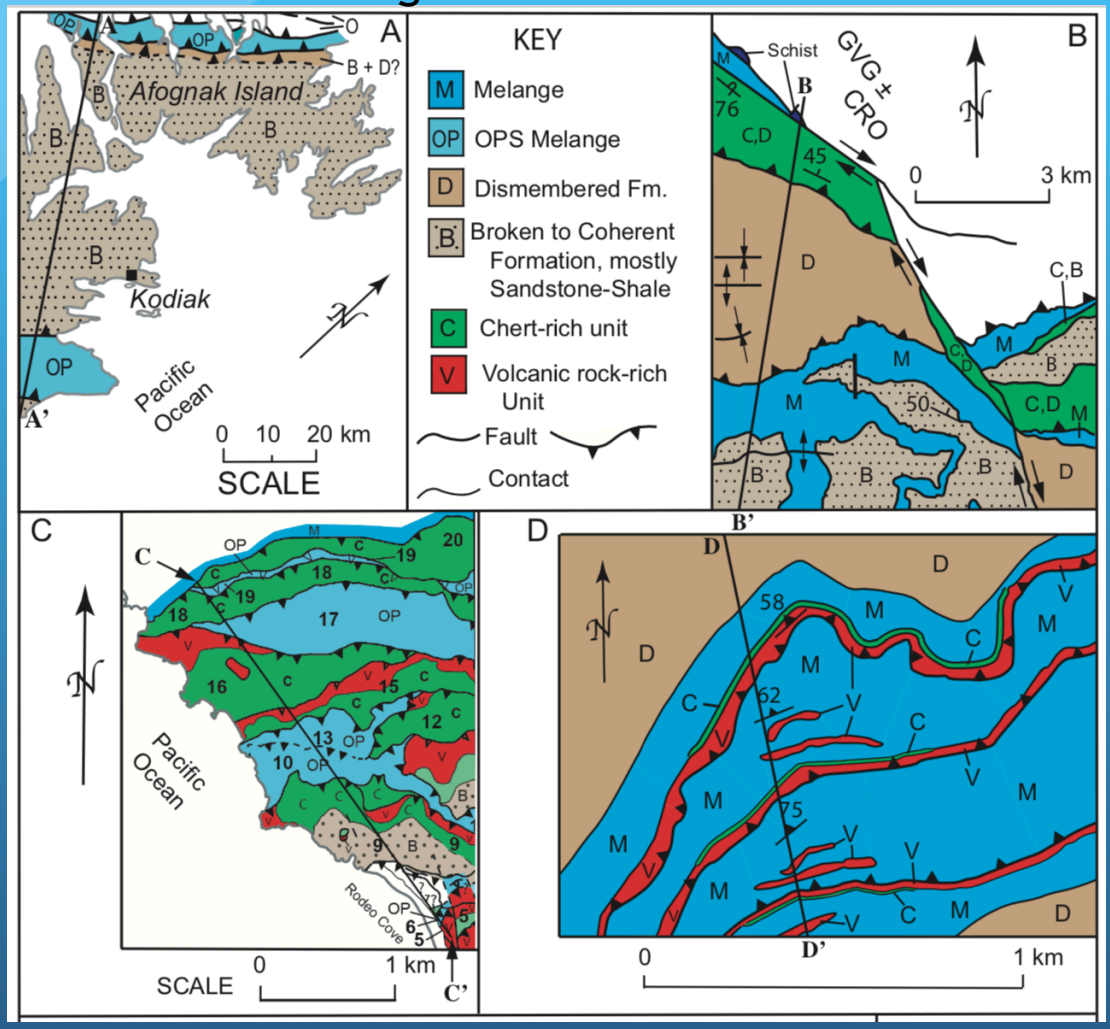
Because by definition, different terranes cannot have correlative units (see Howell et al., 1985)

AUs are generally moderate-sized units, but both small AUs and fragments of formerly larger AUs are present within orogens

Franciscan AUs (<2 Km – 150? Km X <2 Km- ~50?Km X < 50m - >7Km).

S. Alaska
Some > 50 km long

Franciscan Complex, NE Diablo Range, CA -Some > 25 Km long



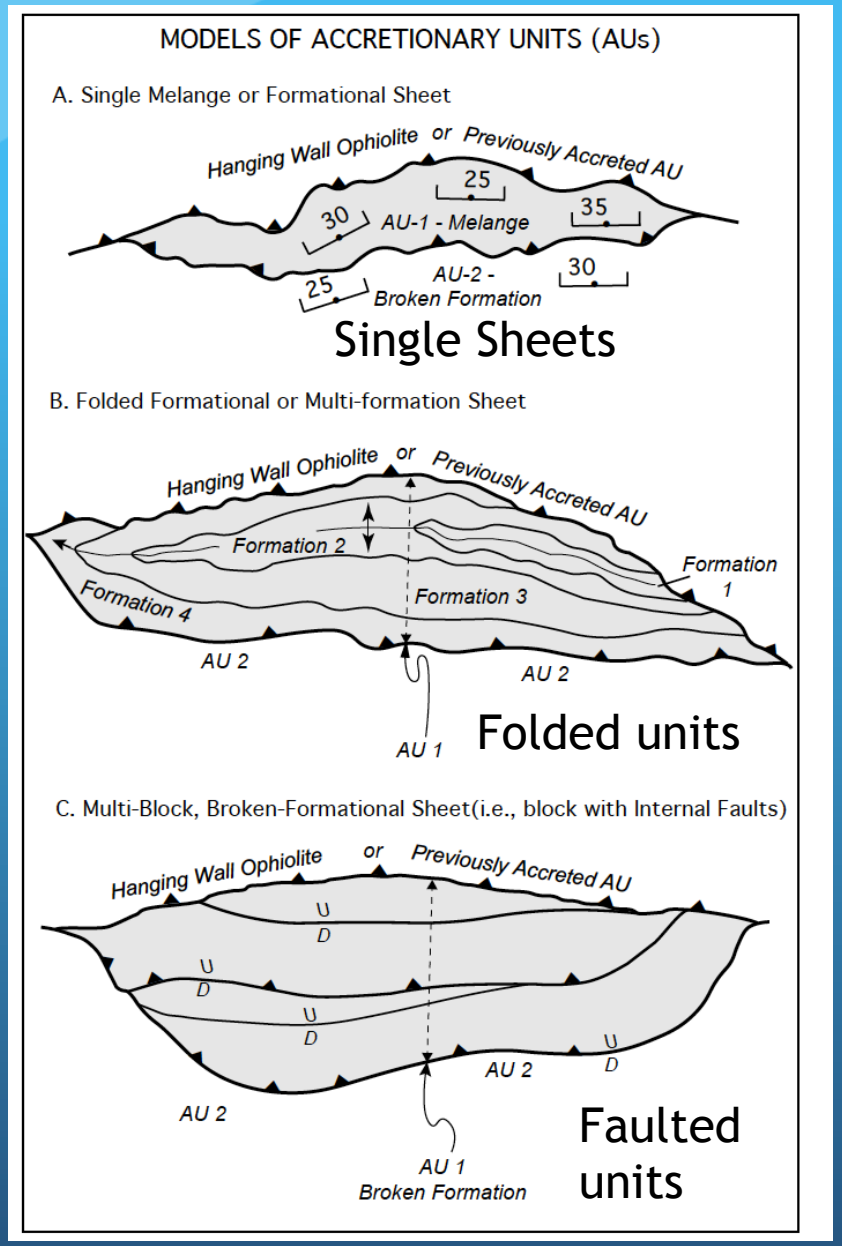
Sources: Modified from (A) Connelly, 1978, Sample and Fisher, 1986; (B) Raymond, 1973, 2017; (C) Bedrossian, 1974, Wahrhaftig, 1984, Meneghini and Moore, 2007; (D) Onishi et al., 2001).

AUs occur in three kinds of basic format —

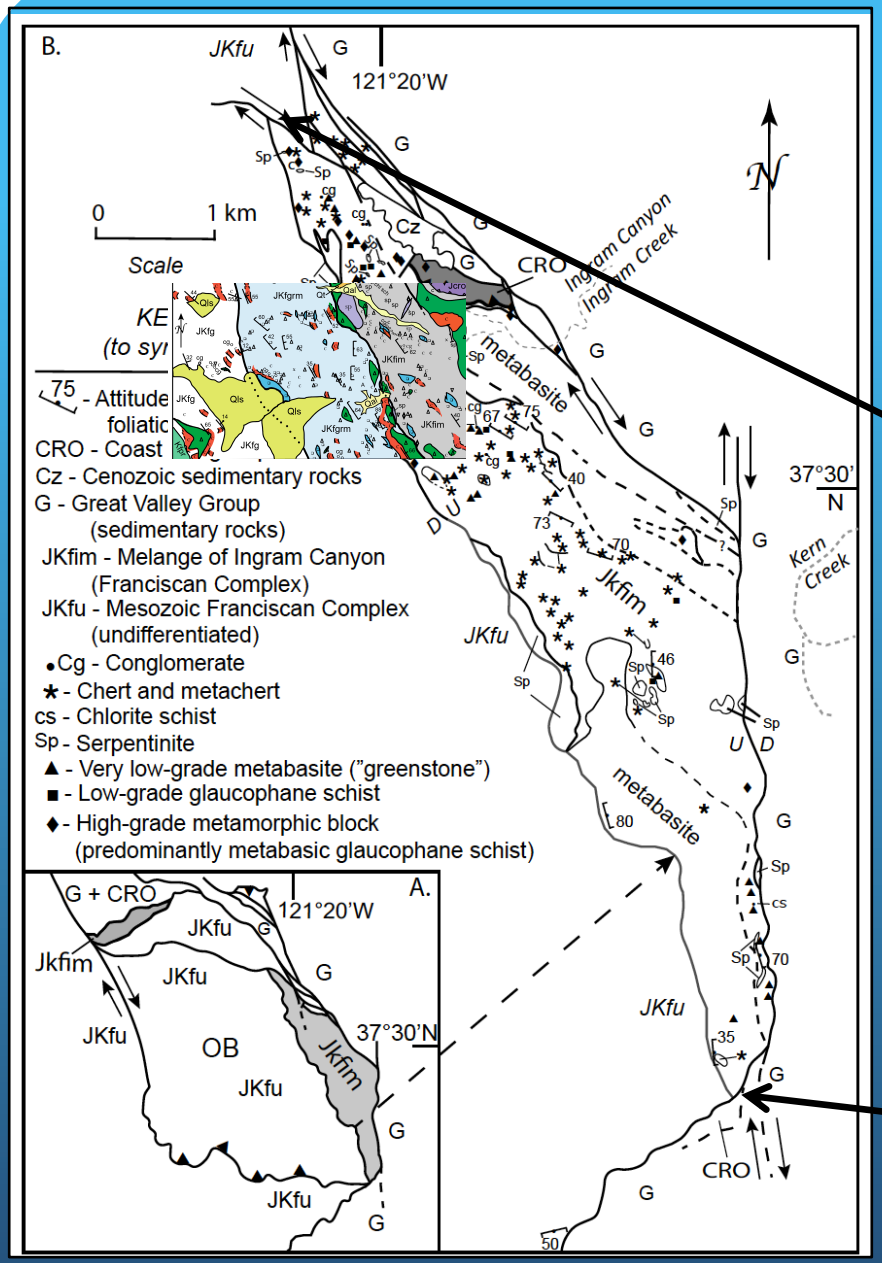
(1) singular sheets of mélange, dismembered formation, or coherent stratigraphic layers;

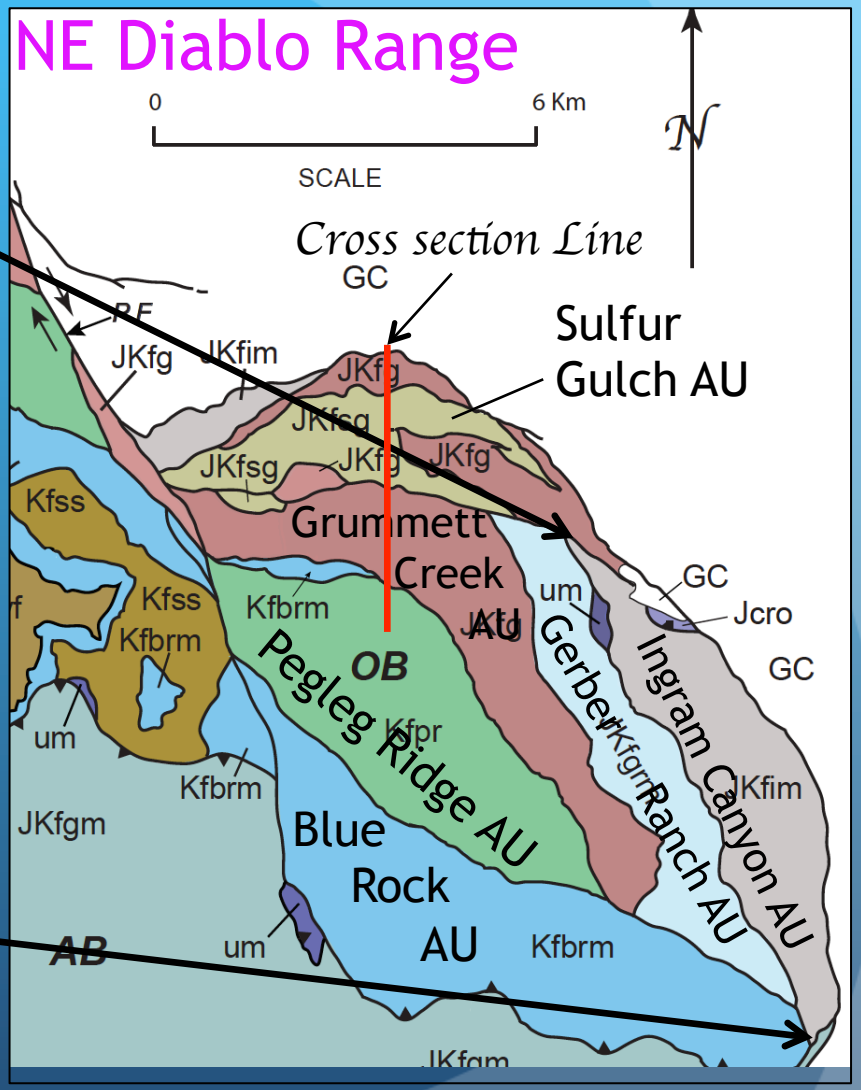
(2) folded units composed of one or more stratigraphic or block-in-matrix unit; and

(3) extensively faulted stratigraphic masses (broken formations or broken groups).



Example of a SINGLE SHEET – the Ingram Canyon AU, NE Diablo Range



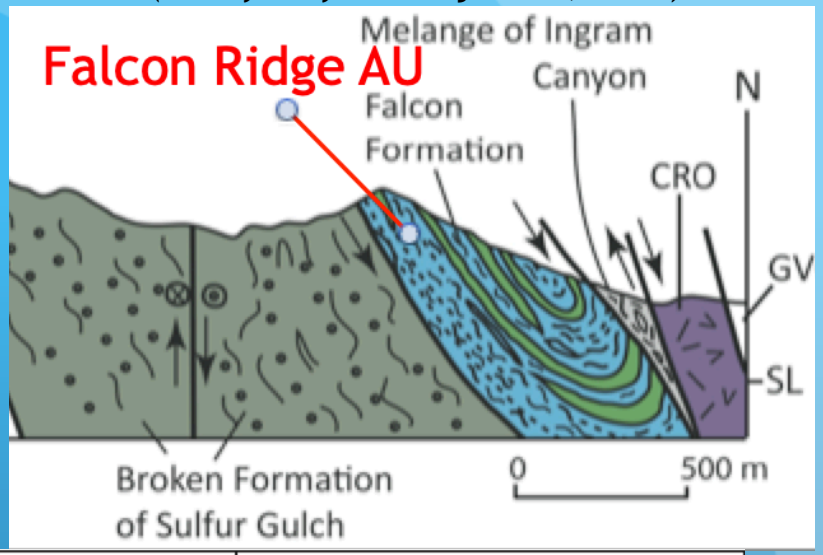


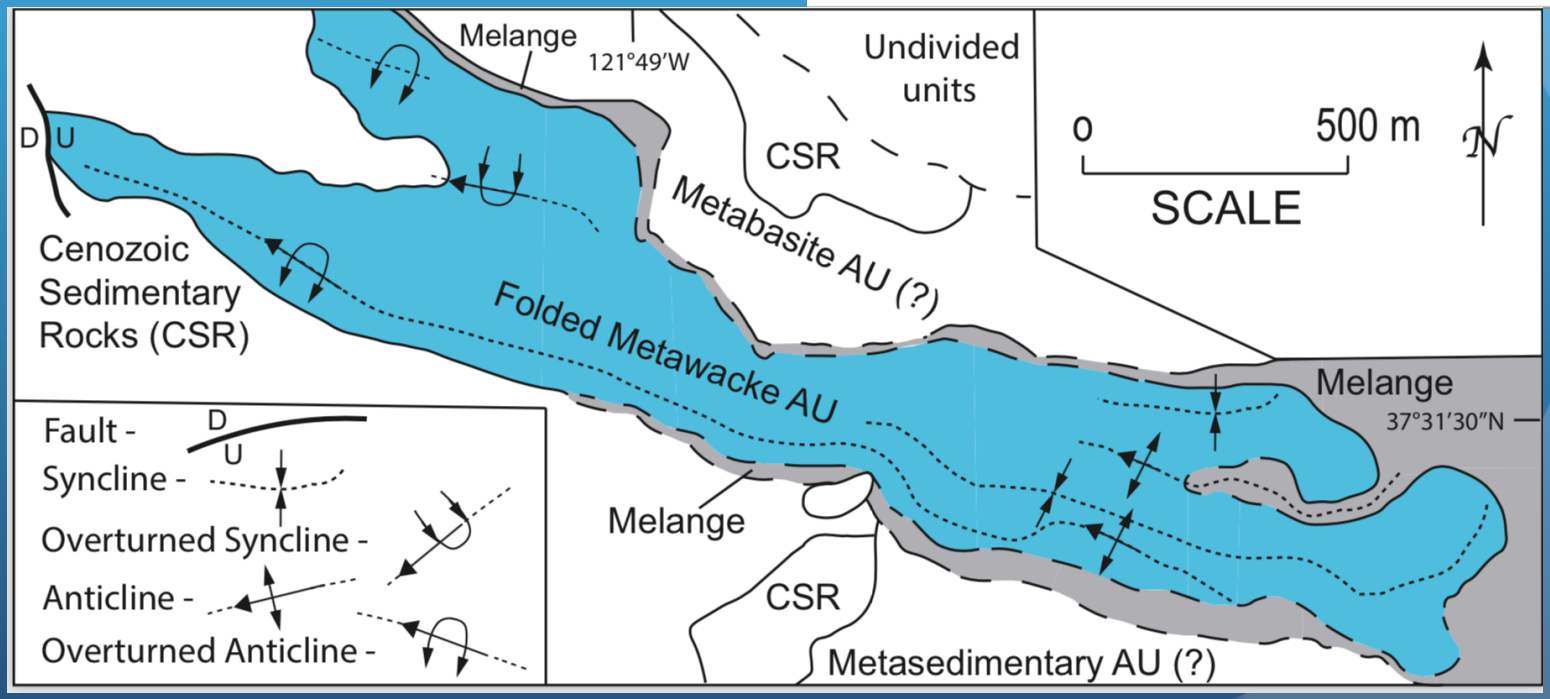
(Modified, in part, from Raymond, 1973, 2014, 2017).

Examples of FOLDED SHEET AUs – Falcon Ridge AU and High Valley AU, N. Diablo Range, CA

High Valley AU, Sunol Regional Wilderness

(Modified from Raymond, 1973)



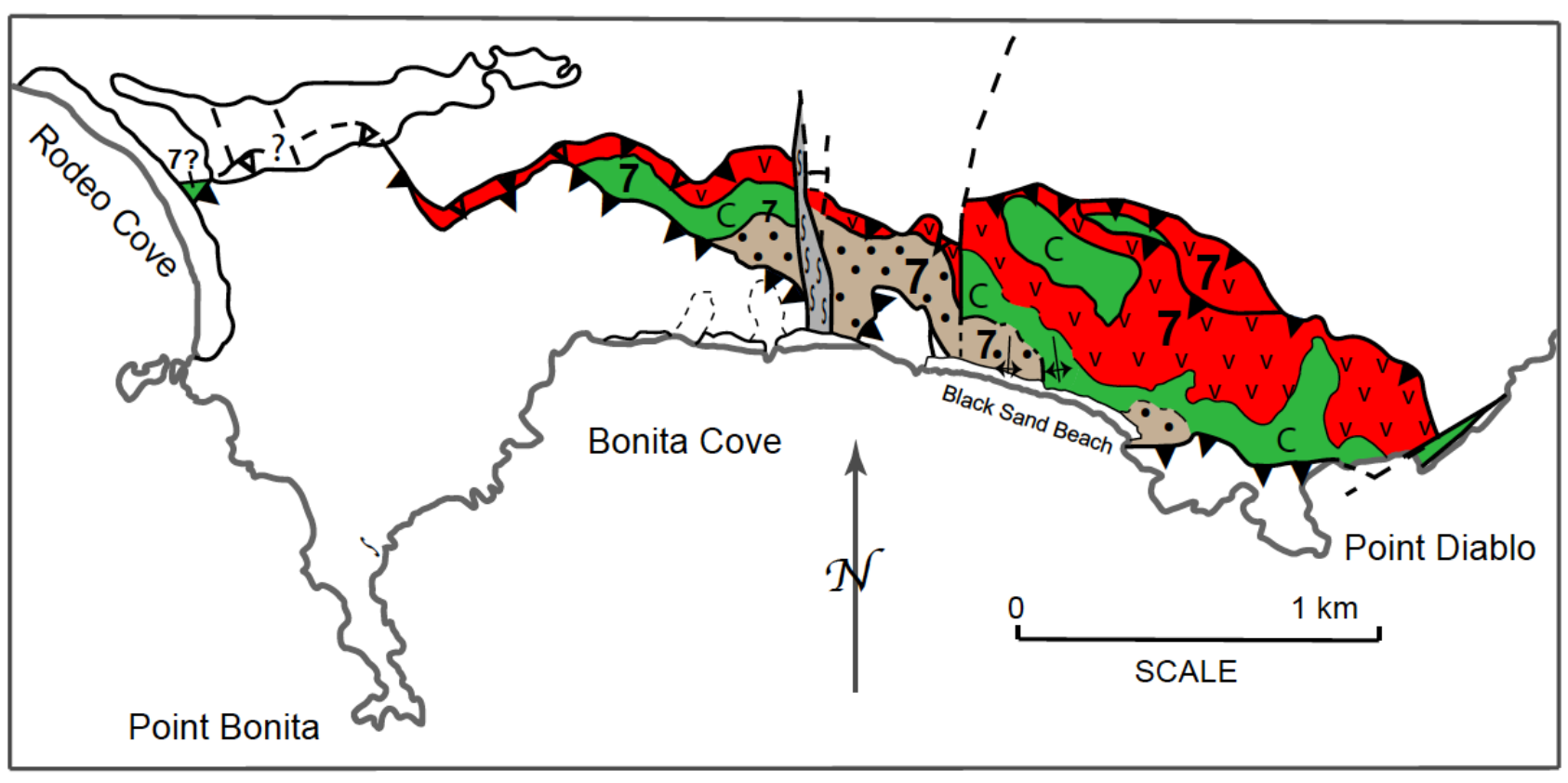


(Modified from Raymond, 1966, unpublished; Wakabayashi, 2015)

Example of a Faulted AU

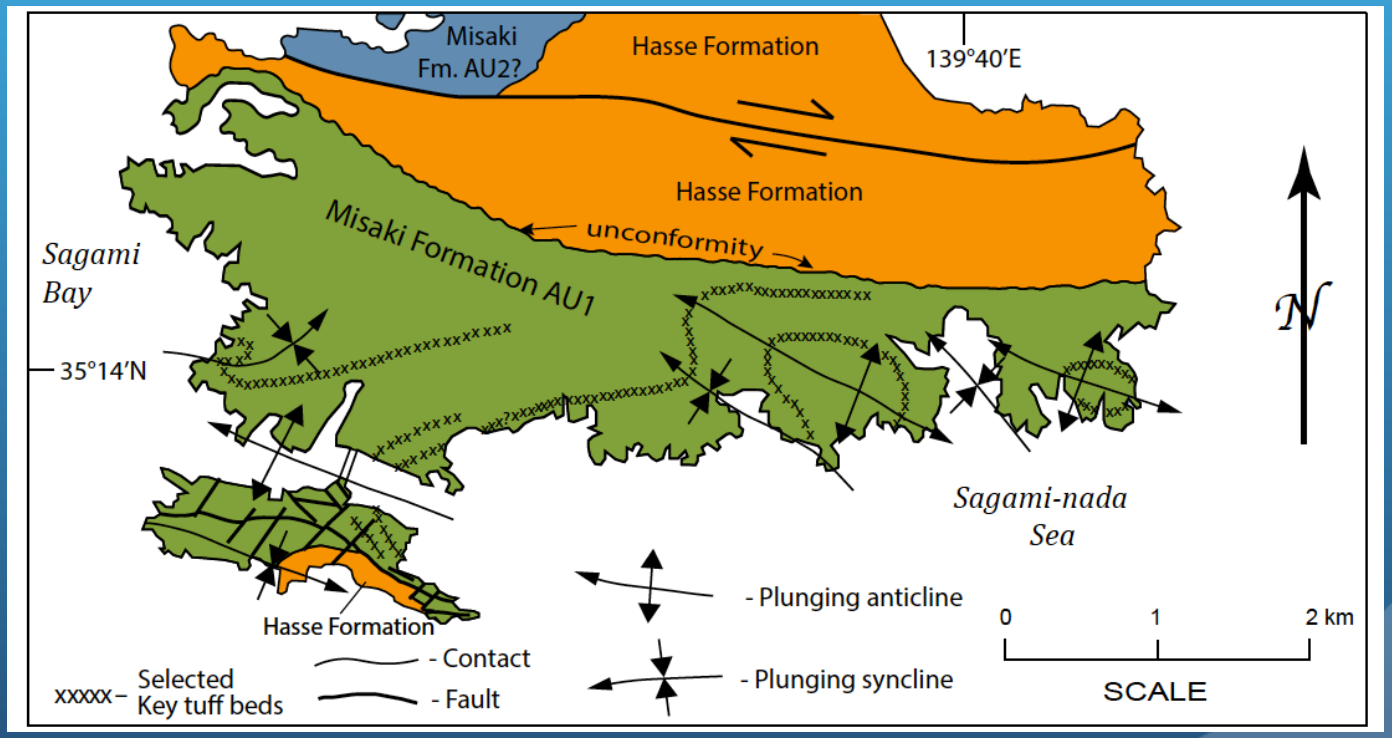
Black Sand-Conzelman AU, Marin Headlands Franciscan Complex, CA

Consists of a broken OPS Group: Metavolcanic rock (v), Metachert (c), and metasandstone (dots), cut by faults.



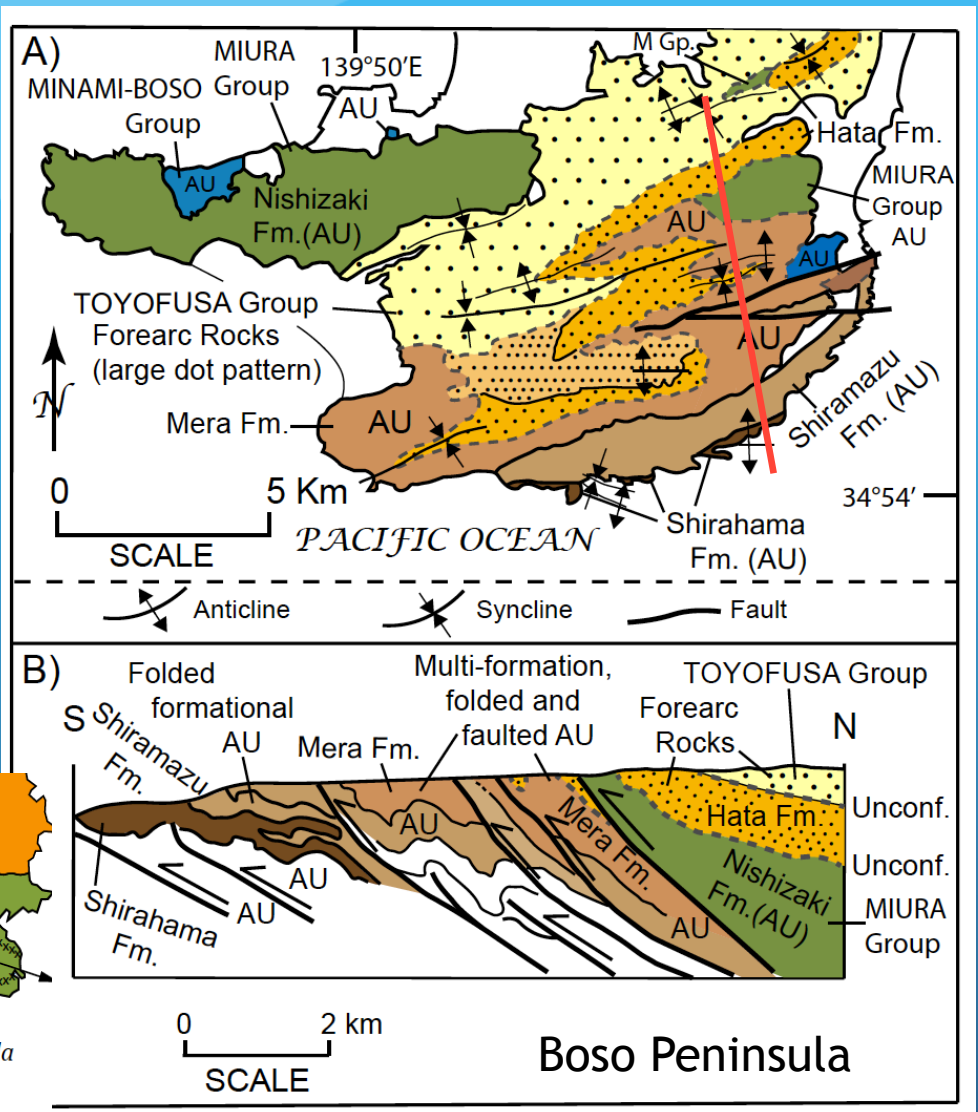
(Modified from Bedrossian, 1974, Wahrhaftig, 1984, Meneghini and Moore, 2007).

Composite AUs with attributes of all three formats are known and multiple suites of deformation features may arise from progressive early deformation or from later superimposed deformational events. In the Miura-Bosa SAC …

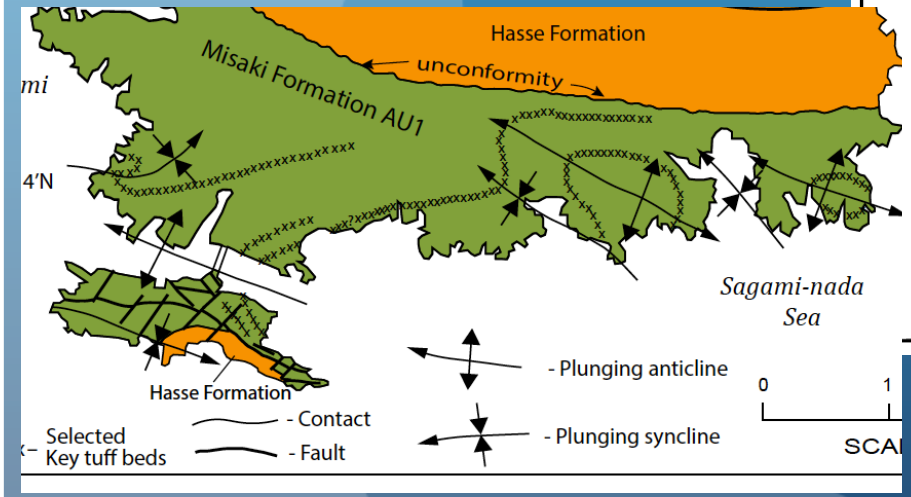


(Modified from Ogawa, et al. 2003; Yamamoto et al., 2009)

Folded & faulted AUs are present *Miura-Boso SAC*



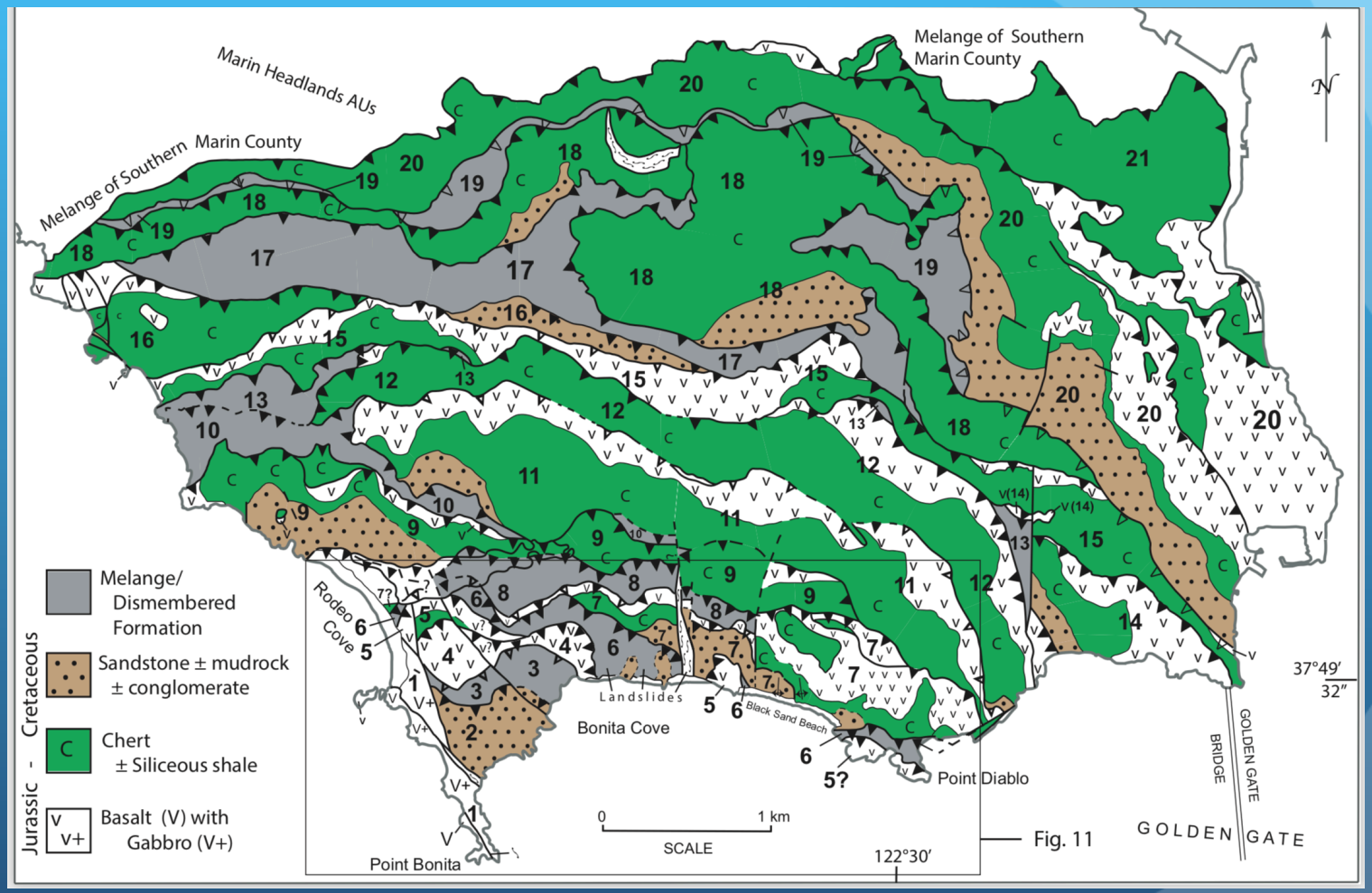
Miura Peninsula



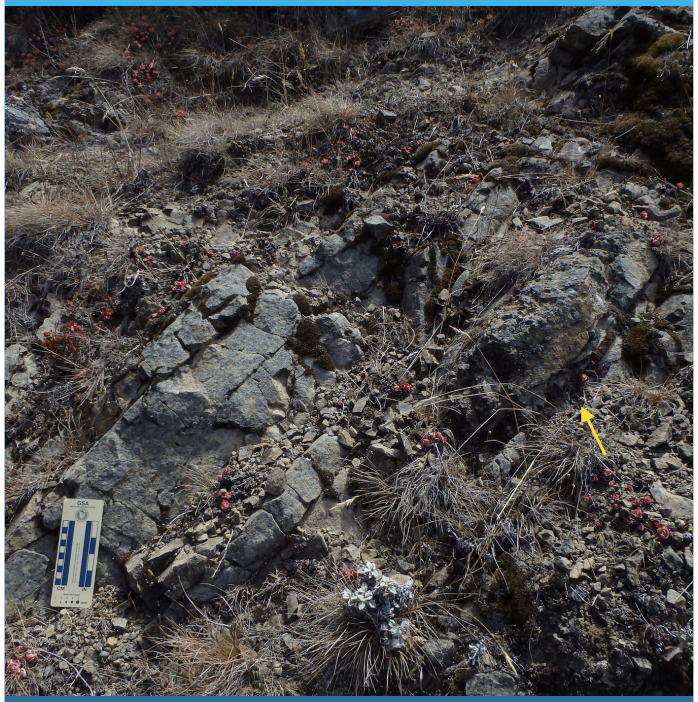
(Modified from Yamamoto and Kawakami, 2005, Kawakami and Shishikura 2006,Muraoka and Ogawa 2011, and Ogawa, unpublished).

Multi-unit, folded and faulted AUs

characterize the Marin Headlands, Franciscan Complex



(Modified from Bedrossian, 1974, Wahrhaftig, 1984, Meneghini and Moore, 2007).



Each AU should be defined on the basis of a unique set of characters that derive from a thorough description of the AU, including its distinct rock types, character, and compositions; and where possible, lithofacies; structures; metamorphic facies; and unit history.

TABLE 2. KNOWN AND UNKNOWN CHARACTERISTICS OF POTENTIAL FRANCISCAN COMPLEX ACCRETIONARY UNITS

Unit Name	AU type	Dimensions	Rock types	Depositional age or age of formation	Age of metamorphism (where applicable)	Grade of metamorphism	Nature of Boundaries	Selected References
Willow Springs "Slab" mafic schist	Sheet	√	Partially known	√	√	√	√	Ernst, 1965; Snow et al., 2009; Wakabayashi & Dumitru, 2007
High Valley AU	Folded Sheet	Partially known	√	?	?	√	√	Wakabayashi, 2015; This paper
Black Sands-Conzelman AU	Faulted Sheet	√	√	Partially known	?	Partially known	√	Bedrossian, 1974; Wahrhaftig, 1984; Murchey, 1984; This paper
False Cape Terrane	Complex	√	√	√	?	?	√	McLaughlin et al., 2000; Ernst & McLaughlin, 2012
Tiburon Ridge (Angel Island) "Terrane"	Folded Sheet	Partially known	√	√	?	√	√	Bero, 2014; Apen et al., 2016
Melange of Ingram Canyon	Melange Sheet	√	√	Partially known	?	√	√	Raymond, 1973; 2014; 2017
Skaggs Springs Schist	Complex; Debatable	Partially known	√	?	√	Partially known	√	Gealey, 1951; Wakabayashi & Dumitru, 2007; Raymond, 2017
Pickett Peak "Terrane"	Complex	√	√	Partially known	Partially known	√	Debated	Blake, 1965; Ghent, 1965; Worrell, 1981; Blake et al., 1982; 1999; Jayko et al., 1986; Brocker & Day, 1995; McLaughlin et al., 2000; Ernst & McLaughlin, 2012; MacKinnon, 2015

? – unknown; √ - known

No AU in the Franciscan Complex has been fully described. The same appears to be true for most other SACs.

Thank you for your Attention!