

The San Gregorio Fault

Hellatite Field Trip; Año Nuevo, CA; May 11, 2003

This section prepared by Stefano Mazzoni (*stefano.mazzoni@exxonmobil.com*)

The SGF is a large-displacement **right-lateral** strike-slip **member** of the **San Andreas fault** zone (p2). Over the last 15 Ma, the SAfz has offset approximately 800 kilometers of earth crust between the Gulf of California to the south and the Mendocino Triple Junction to the north. The **SGfz** is a **highly active** member of this system, with **up to 150 km** of **lateral offset** in the **last 12 Ma** (Clark et al., 1984). It may be **related** to the **Sur-Nacimiento** fault zone to the south, and runs offshore central California between southern Monterey Bay and Año Nuevo Point, where it comes onshore and exposes 26-km of Cretaceous rocks of the Pigeon Point formation. It then returns offshore at San Gregorio Beach and parallels the coastline northward to Pillar Point, where it comes onshore for 4-km and finally returns offshore at Moss Beach. To the north it **joins** the **San Andreas fault** south of Bolinas lagoon.

The SGF is still an active fault system, as evidenced by **trenching** studies done at Año Nuevo (**Weber**, 1980) and from recent **earthquake locations** (p3). The SGF is largely a right-lateral strike-slip system, but **some** splays exhibit a **large vertical motion** component. For example, the **Pomponio block** has been **down-dropped** up to 40 m by vertical fault motion (Weber, 1980). Triangulation studies by Coppersmith & Griggs showed **no strain accumulation** or fault slip over a 16 year period and although no systematic studies have been done, detailed field mapping by Weber **did not reveal** any evidence for **aseismic fault creep** along the SGF.

At **Año Nuevo**, the SGF is composed of **7-8** individual **splays** (p4) that show offsets during late Pleistocene. The **Coastways** fault to the **east** separates the Santa Cruz Mountains structural block from the Pomponio structural block. The **Frijoles** fault is a complex of **anastomosing** and **en echelon** splays that separates the Pomponio block from the Pigeon Point structural block. The **Año Nuevo thrust** (p5) is **well-exposed** in the seacliffs just east of Año Nuevo Point. It strikes 310-330deg and dips ~37deg to the NE. This **low-angle reverse** fault **juxtaposes** siliceous **Monterey Fm** (Miocene) mudstone in the hanging-wall against arkosic sands & muds of the **Vaqueros Fm** in the footwall (Weber, 1980). The **offset** along this fault **cannot** be **determined** and its role in the **kinematics** of the SGF (p6&7) is still debated. Although it is a relatively small **secondary** fault in the SGF system, it has been very active, with an observed slip history from late Tertiary to Holocene. Marine terrace stratigraphy **indicates 5-9 separate faulting events** in the last 105 ky, at a vertical slip rate of **0.05** mm/yr, and most recent offsets as little as **6060 years b.p.** (Weber, 1980).