Atilla Aydin
Professor (Research) of Geological and Environmental Sciences, Emeritus
Geological Sciences

Bio

ACADEMIC APPOINTMENTS
• Emeritus Faculty, Acad Council, Geological Sciences

HONORS AND AWARDS
• Fellow, Geological Society of America (2000)

PROFESSIONAL EDUCATION
• Ph.D., Stanford University, Geology (1978)
• M.S., Stanford University, Geology (1974)
• B.S., Technical University of Istanbul, Geological Engineering (1968)

LINKS
• Structural Geology and Geomechanics: http://pangea.stanford.edu/research/geomech/index.html

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS
Research
I am interested in the formation, geometric patterns, and fluid flow properties of fractures and faults in a broad range of scales. My students and I are involved in projects that require both a strong field component and modeling. The field component is similar to a detective's work, which aims to establish temporal and spatial relationships among various elements of a structure. The modeling component is like the moral of the story, enabling one to see through the rationale and use it for guidance in the future.

Professional Activities
Fellow, Geological Society of America; Member, American Geophysical Union and American Association of Petroleum Geologists

PROJECTS
• Rock Fracture Knowledgebase - Stanford University

Publications

PUBLICATIONS
• Arvid M. Johnson (1938-2018): A trailblazer in geomechanics using physical processes
Aydin, A., Reches, Z., Holzhausen, G., Neavel, K.  
American Geophysical Union. Eos.  
2019; Eos, (100): online

- **Rock Fracture Knowledgebase**  
Aydin, A., Zhong, J.  
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Deng, S., et al  
2017

- The influence of resolution on scale-dependent clustering in fracture spacing data *INTERPRETATION-A JOURNAL OF SUBSURFACE CHARACTERIZATION*  
Roy, A., Aydin, A., Mukerji, T.  
2016; 4 (3): T387-T394

- Structural and statistical characterization of joints and multi-scale faults in an alternating sandstone and shale turbidite sequence at the Santa Susana Field Laboratory: Implications for their effects on groundwater flow and contaminant transport *JOURNAL OF STRUCTURAL GEOLOGY*  
Cilona, A., Aydin, A., Likerman, J., Parker, B., Cherry, J.  
2016; 85: 95-114

- Mechanism of formation of wiggly compaction bands in porous sandstone: 1. Observations and conceptual model *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*  
Liu, C., Pollard, D. D., Deng, S., Aydin, A.  
2015; 120 (12): 8138-8152

- The role of mechanical stratigraphy on normal fault growth across a Cretaceous carbonate multi-layer, central Texas (USA) *ITALIAN JOURNAL OF GEOSCIENCES*  
Agosta, F., Wilson, C., Aydin, A.  
2015; 134 (3): 423-441

- The dynamics and interaction of compaction bands in Valley of Fire State Park, Nevada (USA): Implications for their growth, evolution, and geostatistical property *TECTONOPHYSICS*  
Torabi, A., Aydin, A., Cilona, A., Jarsto, B. E., Deng, S.  
2015; 657: 113-128

- Cross-bedding related anisotropy and its interplay with various boundary conditions in the formation and orientation of joints in an aeolian sandstone *JOURNAL OF STRUCTURAL GEOLOGY*  
Deng, S., Cilona, A., Morrow, C., Mapeli, C., Liu, C., Lockner, D., Prasad, M., Aydin, A.  
2015; 77: 175-190

- Permeability of a fault zone crosscutting a sequence of sandstones and shales and its influence on hydraulic head distribution in the Chatsworth Formation, California, USA *HYDROGEOLOGY JOURNAL*  
Cilona, A., Aydin, A., Johnson, N. M.  
2015; 23 (2): 405-419

- The strength anisotropy of localized compaction: A model for the role of the nature and orientation of cross-beds on the orientation and distribution of compaction bands in 3-D *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*  
Deng, S., Aydin, A.  
2015; 120 (3): 1523-1542

- Permeability characterization of natural compaction bands using core flooding experiments and 3D image-based analysis: Comparing and contrasting the results from two different methods *American Association of Petroleum Geologists Bulletin*  
Deng, S., Zuo, L., Aydin, A., Dvorkin, J., Mukerji, T.  
2015; 99 (1): 27-49

- Failure modes of shales and their implications for natural and man-made fracture assemblages *AAPG BULLETIN*  
Aydin, A.  
2014; 98 (11): 2391-2409

Aydin, A., de Joussineau, G.
2014; 63: 12-26

Fluid flow through porous sandstone with overprinting and intersecting geological structures of various types. *Advances in the Study of Fractured Reservoirs, Special Publications, 374*


Is there a link between faulting and magmatism in the south-central Aegean Sea? *Geological Magazine*

Kokkalas, S., Aydin, A.
2013; 150 (2): 193-224

Distribution of compaction bands in 3D in an aeolian sandstone: The role of cross-bed orientation. *Tectonophysics*

Deng, S., Aydin, A.
2012; 574: 204-218

Spatial Statistical Properties of Pressure Solution Seams in Clastic Rocks in Southwest Ireland. *Mathematical Geosciences*

Nenna, F., Zhou, X., Aydin, A.
2012; 44 (5): 595-617

Mechanics of the formation of orthogonal sets of solution seams, and solution seams and veins and parallel solution seams and veins. *Tectonophysics*

Zhou, X., Aydin, A.
2012; 532: 242-257

Growth processes, dimensional parameters and scaling relationships of two conjugate sets of compactive shear bands in porous carbonate grainstones, Favignana Island, Italy. *Journal of Structural Geology*

Tondi, E., Cilona, A., Agosta, F., Aydin, A., Rustichelli, A., Renda, P., Giunta, G.
2012; 37: 53-64

The role of pressure solution seam and joint assemblages in the formation of strike-slip and thrust faults in a compressive tectonic setting; The Variscan of south-western Ireland. *Journal of Structural Geology*

Nenna, F., Aydin, A.
2011; 33 (11): 1595-1610

From outcrop to flow simulation: Constructing discrete fracture models from a LIDAR survey. *AAPG Bulletin*

2011; 95 (11): 1883-1905

Use of outcrop observations, geostatistical analysis, and flow simulation to investigate structural controls on secondary hydrocarbon migration in the Anacacho Limestone, Uvalde, Texas. *AAPG Bulletin*

Wilson, C. E., Aydin, A., Durlofsky, L. J., Boucher, A., Brownlow, D. T.
2011; 95 (7): 1181-1206

The formation and growth of pressure solution seams in clastic rocks: A field and analytical study. *Journal of Structural Geology*

Nenna, F., Aydin, A.
2011; 33 (4): 633-643

Mechanics of pressure solution seam growth and evolution. *Journal of Geophysical Research-Solid Earth*

Zhou, X., Aydin, A.
2010; 115

Analysis of the growth of strike-slip faults using effective medium theory. *Journal of Structural Geology*

Aydin, A., Berryman, J. G.
2010; 32 (11): 1629-1642

Quasi-static analysis of elastic behavior for some systems having higher fracture densities. *International Journal for Numerical and Analytical Methods in Geomechanics*

Berryman, J. G., Aydin, A.
2010; 34 (16): 1687-1724

• Oblique normal faulting along the northern edge of the Majella Anticline, central Italy Inferences on hydrocarbon migration and accumulation JOURNAL OF STRUCTURAL GEOLOGY
  Agosta, F., Alessandroni, M., Tondi, E., Aydin, A.
  2010; 32 (9): 1317-1333

• Deformation along the leading edge of the Maiella thrust sheet in central Italy JOURNAL OF STRUCTURAL GEOLOGY
  Aydin, A., Antonellini, M., Tondi, E., Agosta, F.
  2010; 32 (9): 1291-1304

• Bed-parallel compaction bands in aeolian sandstone: Their identification, characterization and implications TECTONOPHYSICS
  Aydin, A., Ahmado, R.
  2009; 479 (3-4): 277-284

• Segmentation along Strike-Slip Faults Revisited PURE AND APPLIED GEOPHYSICS
  de Joussineau, G., Aydin, A.
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• Oblique normal faulting along the northern edge of the Majella Anticline, central Italy: Inferences on hydrocarbon migration and accumulation JOURNAL OF STRUCTURAL GEOLOGY
  Agosta, F., Alessandroni, M., Tondi, E., Aydin, A.
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  2009; 31: 251-259

• Failure modes in deep-water carbonates and their impact for fault development: Majella Mountain, Central Apennines, Italy MARINE AND PETROLEUM GEOLOGY
  Antonellini, M., Tondi, E., Agosta, F., Aydin, A., Cello, G.
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• Geochemical traces of CO2-rich fluid flow along normal faults in central Italy GEOPHYSICAL JOURNAL INTERNATIONAL
  Agosta, F., Mulch, A., Chamberlain, P., Aydin, A.
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  Gonzales, J., Aydin, A.
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• Structural characterization of deep-water deposits in a foreland basin, Silla Syncline (Chilean Patagonia), with applications to depositional processes JOURNAL OF STRUCTURAL GEOLOGY
  Gonzales, J., Aydin, A.
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• The evolution of the damage zone with fault growth in sandstone and its multiscale characteristics JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH
  de Joussineau, G., Aydin, A.
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• Permeability upscaling of fault zones in the Aztec Sandstone, Valley of Fire State Park, Nevada, with a focus on slip surfaces and slip bands HYDROGEOLOGY JOURNAL
  Ahmadov, R., Aydin, A., Karimi-Fard, M., Durlofsky, L. J.
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• Physical properties of carbonate fault rocks, fucino basin (Central Italy): implications for fault seal in platform carbonates GEOFLUIDS
  Agosta, F., Prasad, M., Aydin, A.
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• Characterization of strike-slip fault - Splay relationships in sandstone JOURNAL OF STRUCTURAL GEOLOGY
• Evolution of fracture and fault-controlled fluid pathways in carbonates of the Albanides fold-thrust belt  AAPG BULLETIN
  Wall, B. R., Girbacea, R., Mesonjesi, A., Aydin, A.
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• Failure modes of the lineaments on Jupiter's moon, Europa: Implications for the evolution of its icy crust  JOURNAL OF STRUCTURAL GEOLOGY
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• Using an elastic dislocation model to investigate static Coulomb stress change scenarios for earthquake ruptures in the eastern Marmara Sea region, Turkey International Meeting on Analogue and Numerical Modelling of Geological Processes
  Muller, J. R., Aydin, A., Wright, T. J.
  GEOLOGICAL SOCIETY PUBLISHING HOUSE.2006: 397–414

• Geological and mathematical framework for failure modes in granular rock  JOURNAL OF STRUCTURAL GEOLOGY
  Aydin, A., Borja, R. I., Eichhubl, P.
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• The role of deformation bands, stylolites and sheared stylolites in fault development in carbonate grainstones of Majella Mountain, Italy  JOURNAL OF STRUCTURAL GEOLOGY
  Tondi, E., Antonellini, M., Aydin, A., Marchegiani, L., Cello, G.
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• Architecture and deformation mechanism of a basin-bounding normal fault in Mesozoic platform carbonates, central Italy  JOURNAL OF STRUCTURAL GEOLOGY
  Agosta, F., Aydin, A.
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• Structure, petrophysics, and diagenesis of shale entrained along a normal fault at Black Diamond Mines, California - Implications for fault seal  AAPG BULLETIN
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• Fault and fracture systems in a fold and thrust belt: An example from Bolivia  AAPG BULLETIN
  Florez-Nino, J. M., Aydin, A., Mavko, G., Antonellini, M., Ayaviri, A.
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• Using mechanical modeling to constrain fault geometries proposed for the northern Marmara Sea  JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH
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• Structural evolution of fault zones in sandstone by multiple deformation mechanisms: Moab fault, southeast Utah  GEOLOGICAL SOCIETY OF AMERICA BULLETIN
  Davatzes, N. C., Eichhubl, P., Aydin, A.

• Petrophysical properties of cataclastic fault rock in sandstone  Faults, fluid flow, and petroleum traps
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• Distribution and nature of fault architecture in a layered sandstone and shale sequence: An example from the Moab fault  Faults, fluid flow, and petroleum traps
  Davatzes, N. C., Aydin, A.
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• The evolution of faults formed by shearing across joint zones in sandstone JOURNAL OF STRUCTURAL GEOLOGY Myers, R., Aydin, A. 2004; 26 (5): 947-966


• Computational modeling of deformation bands in granular media. I. Geological and mathematical framework COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING Borja, R. I., Aydin, A. 2004; 193 (27-29): 2667-2698

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• Investigating the transition between the 1967 Mudurnu Valley and 1999 Izmit earthquakes along the North Anatolian fault with static stress changes GEOPHYSICAL JOURNAL INTERNATIONAL Muller, J. R., Aydin, A., Maerten, F. 2003; 154 (2): 471-482

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Ductile opening-mode fracture by pore growth and coalescence during combustion alteration of siliceous mudstone. Eichhubl, P.; Aydin, A.

Overprinting faulting mechanisms in high porosity sandstones of SE Utah. Davatzes, N. C.; Aydin, A.

Formation and growth of normal faults in carbonates within a compressive environment. Graham, B.; Antonellini, M.; Aydin, A.


Alteration and fracturing of siliceous mudstone during in situ combustion, Orcutt field, California. Lore, J. S.; Eichhubl, P.; Aydin, A.


Anatomy of a normal fault with shale smear: Implications for fault seal. Aydin, A.; Eyal, Y.


Surface ruptures of the 17 August and 12 November 1999 Izmit and Duzce earthquakes in northwestern Anatolia, Turkey: Their tectonic and kinematic significance and the associated damage. Aydin, A.; Kalafat, D.


Concentration of shearing deformation related to changes in strike of monoclinal fold axes: the Waterpocket monocline, Utah. Roznovsky, T. A.; Aydin, A.

A deterministic methodology for prediction of fracture distribution in basaltic multiflows. Lore, J.; Aydin, A.; Goodson, K. E.

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• **Fluid flow in discrete joint sets: Field observations and numerical simulations** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
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• **Numerical simulation of departures from radial drawdown in a faulted sandstone reservoir with joints and deformation bands** *Geological Society, London, Special Publications*
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