DEPREM ODAK MEKANİZMASI

Doç.Dr. Eşref YALÇINKAYA

(9. Ders)

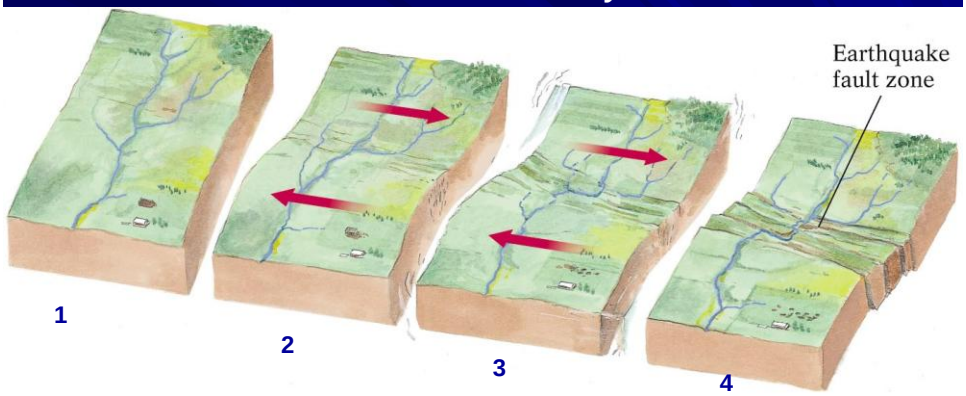
Elastik rebound (yenilenme) teorisi :

Elastik Rebound Teorisi'ne göre;

- Komşu blokların birbirine göre hareketi ve elastik deformasyon enerjisinin depolanması
- Fay yoksa çevredeki kayaçların dayanma gücü aşıldığında, fay varsa sürtünme kuvveti aşıldığında kaymanın başlaması

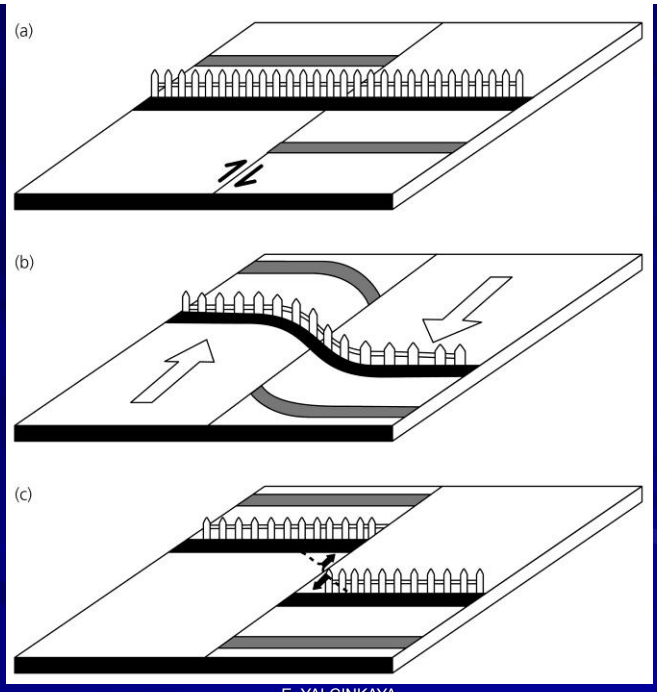
1. Gerilme birikimi

2. Fay boyunca elastik deformasyon



3. Kayaç dayanımının aşıldığı noktada kırılmanın başlaması
4. Fay alanı boyunca depolanan enerjinin serbestlenmesi

E. YALÇINKAYA 3

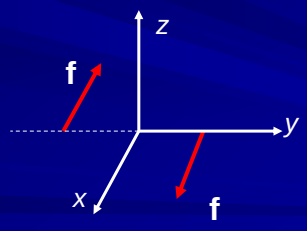


E. YALÇINKAYA 4

Kaynak modelleri :

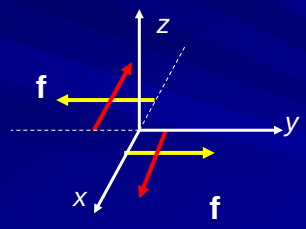
- **Tek kuvvet çifti**

  Birbirine eşit, fakat ters yönlü iki kuvvet ve moment sıfırdan farklı.



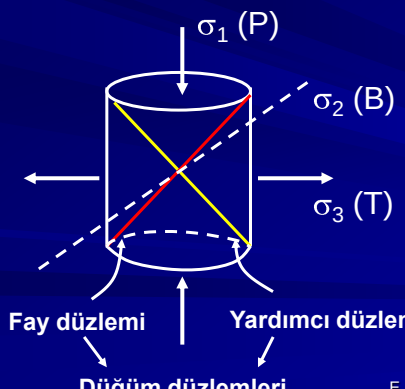
- İki kuvvet çifti

  Birbirinin aynı iki kuvvet çifti, fakat birbirlerine karşı koyacak yönde etkidiğinden moment sıfır.



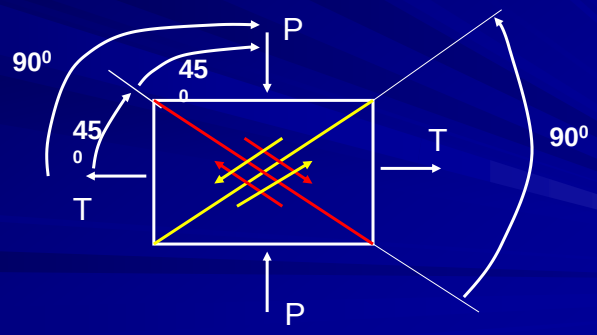
Asal Gerilmeler ve Ana Faylanma Türleri

Deprem odak bölgesinde gerilme bileşenleri üç eksende incelenebilir.

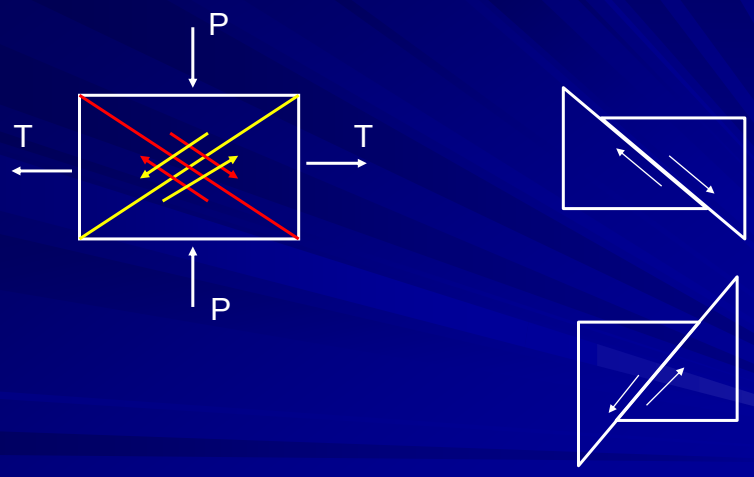


- P ; “maksimum basınç” ekseni veya maksimum asal gerilme
- T ; “maksimum tansiyon” ekseni veya minimum asal gerilme
- B ; orta gerilme ekseni veya sıfır vektörü

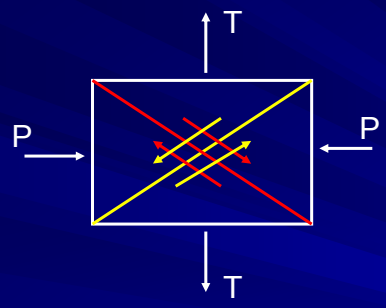
- Gerilme bileşenleri (P, T ve B eksenleri) arasında daima 90 derece açı farkı vardır.
- Düğüm düzlemleri ile P ve T eksenleri arasında daima 45 derece açı farkı vardır.
- Fay düzlemi ile yardımcı düzlem arasında daima 90 derece açı farkı vardır.

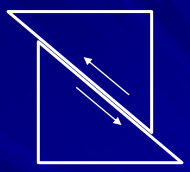


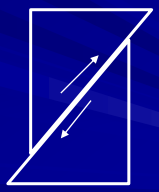
- Normal faylanma



Ters faylanma

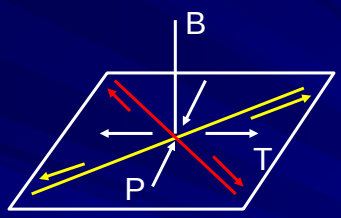




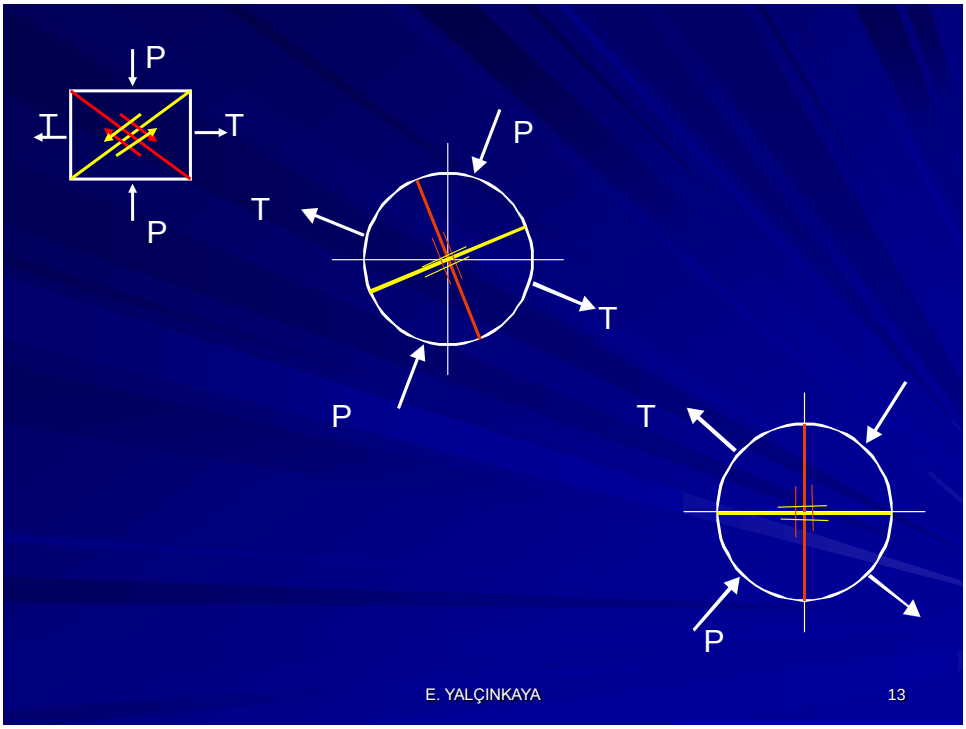


E. YALÇINKAYA 11

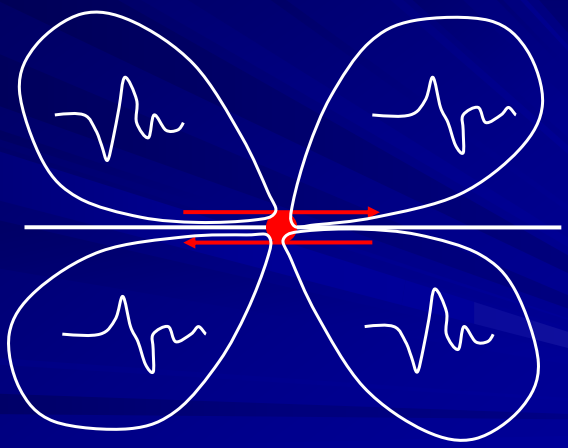
Doğrultu atımlı faylanma

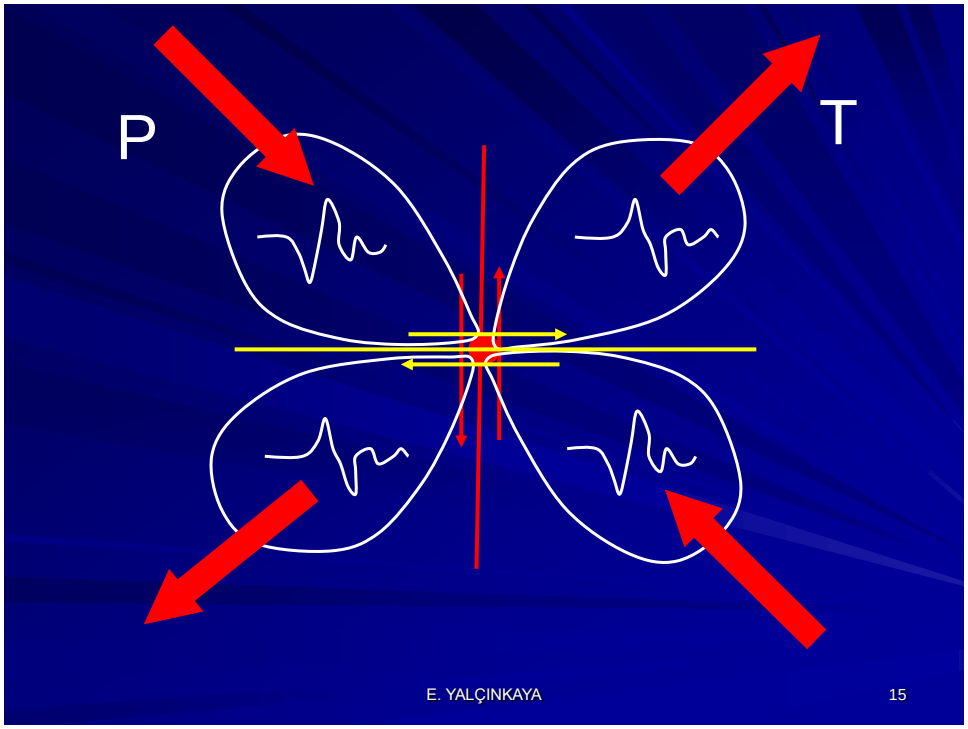


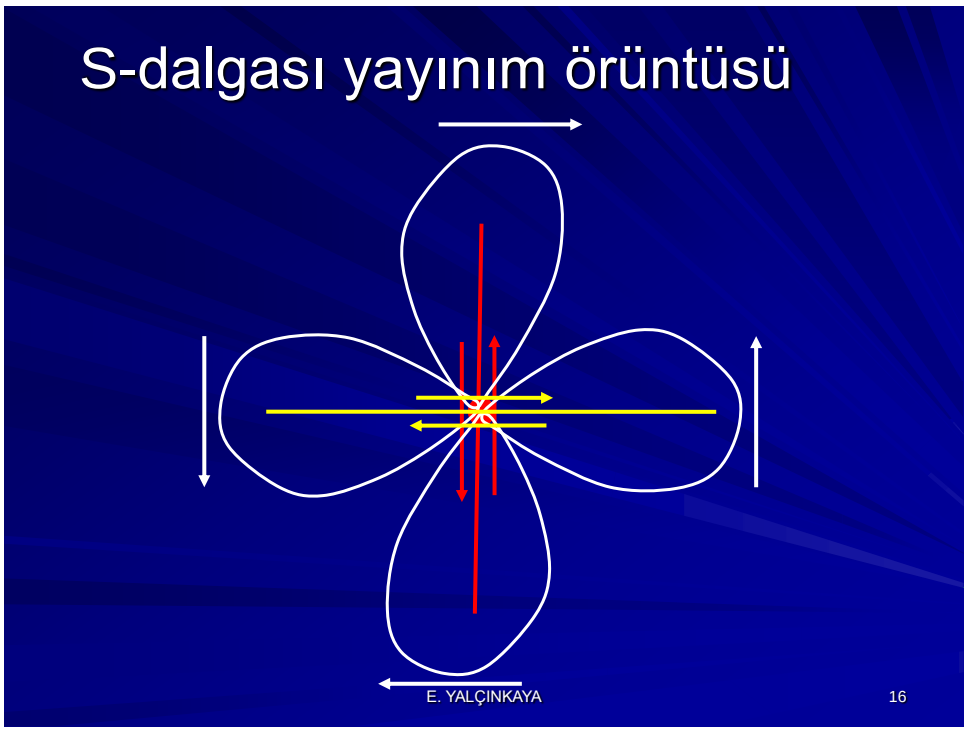
E. YALÇINKAYA 12



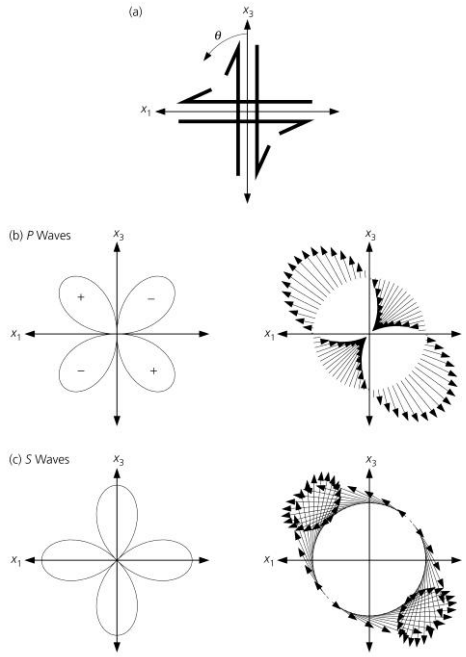
P-dalgası yayınım örüntüsü



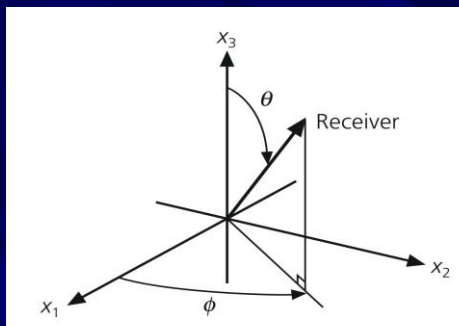

P
T
E. YALÇINKAYA
15

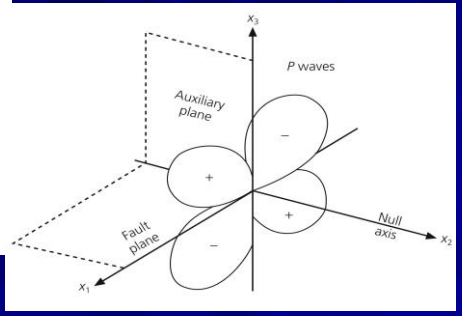

S-dalgası yayınım örüntüsü
E. YALÇINKAYA
16

İki kuvvet çifti modelinde P ve S dalgaları genlik ve ilk hareket dağılımları



17

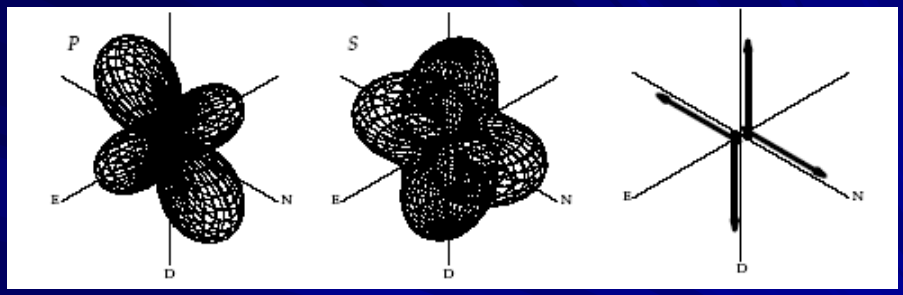


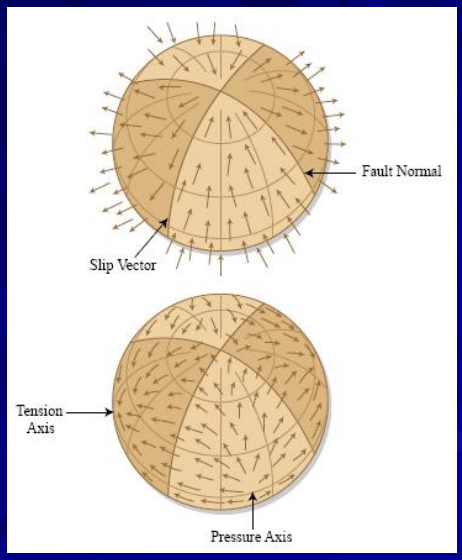


$$u_r = \frac{1}{4\pi\rho\alpha^3 r}\dot{M}(t - r/\alpha)\sin 2\theta\cos\phi$$

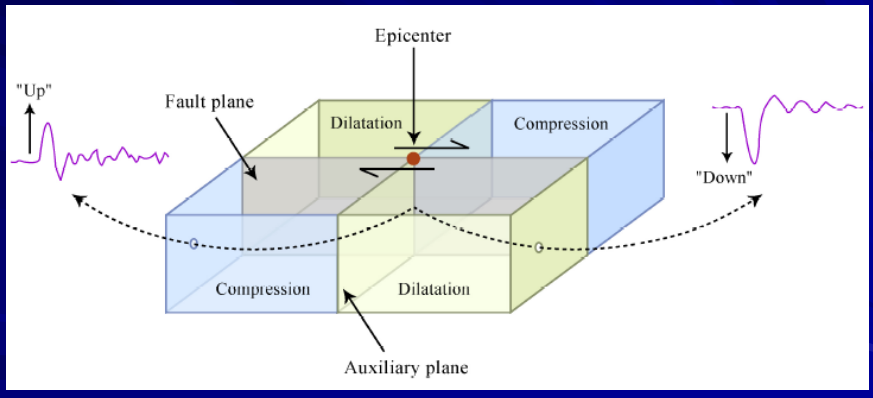
$$u_\theta = \frac{1}{4\pi\rho\beta^3 r}\dot{M}(t - r/\beta)\cos 2\theta\cos\phi$$

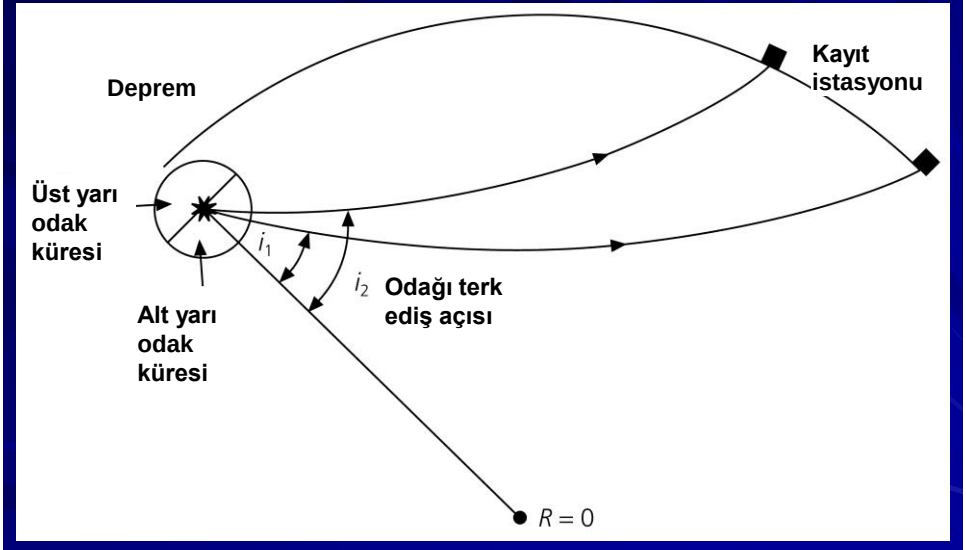
$$u_\phi = \frac{1}{4\pi\rho\beta^3 r}\dot{M}(t - r/\beta) - \cos\theta\sin\phi$$


P
S
E
N
D
E
N
D
E
N
D

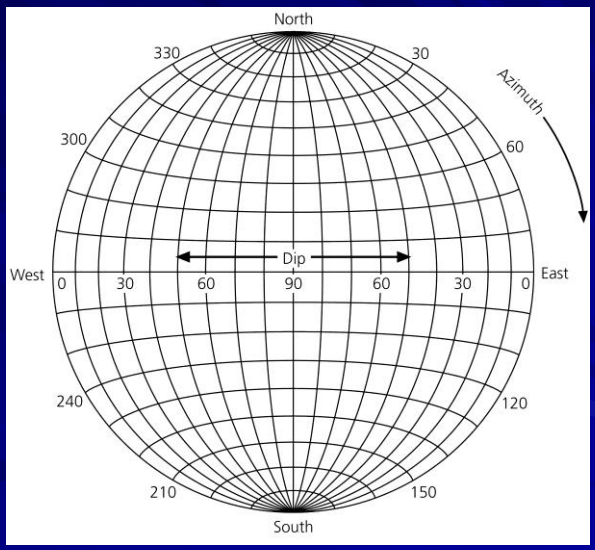

Fault Normal
Slip Vector
Tension Axis
Pressure Axis

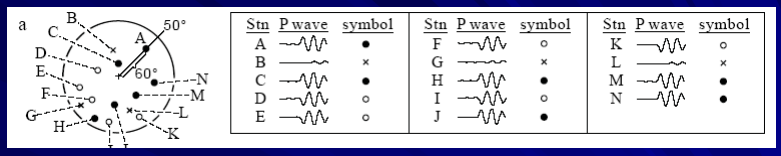
P-dalgası ilk hareketlerinden odak mekanizması çözümü



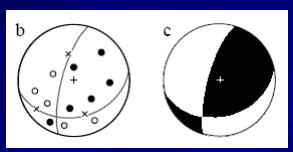


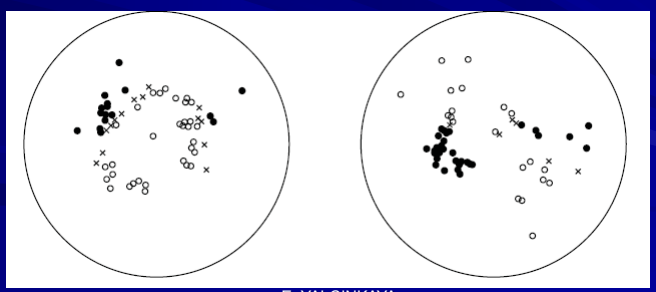
Sterografik Projeksiyon

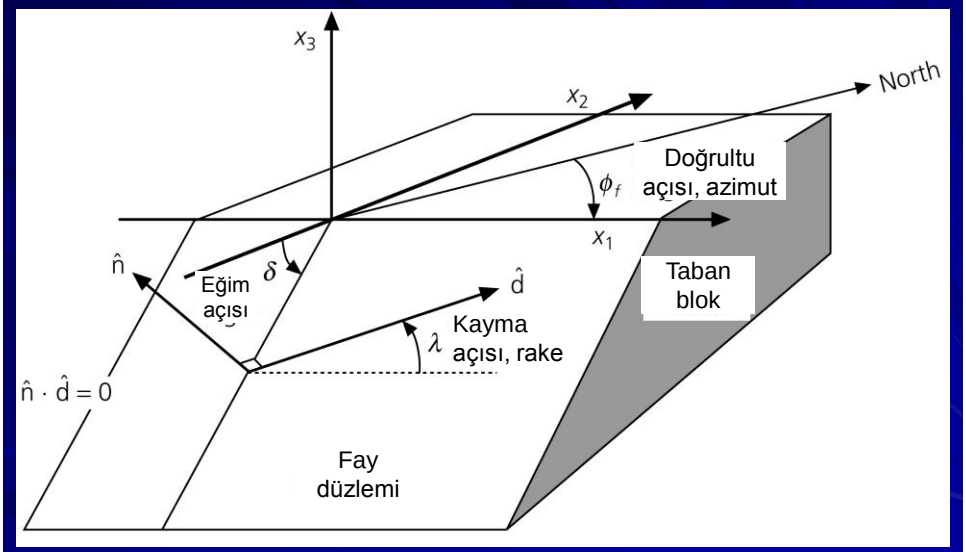


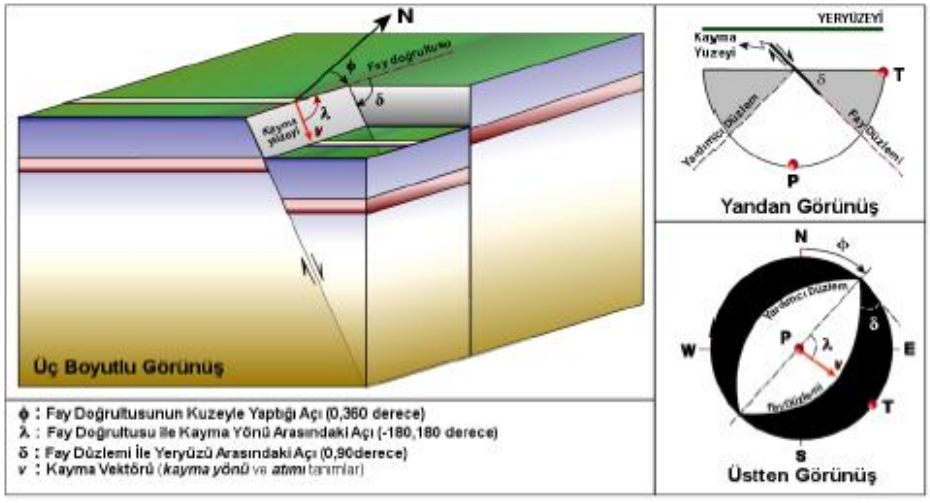


Stn	P wave	symbol	Stn	P wave	symbol	Stn	P wave	symbol
A		●	F		○	K		○
B		×	G		×	L		×
C		●	H		●	M		●
D		○	I		○	N		●
E		○	J		●			



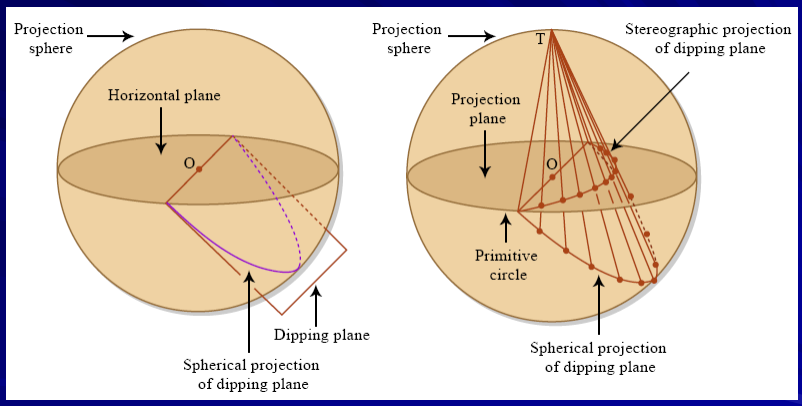


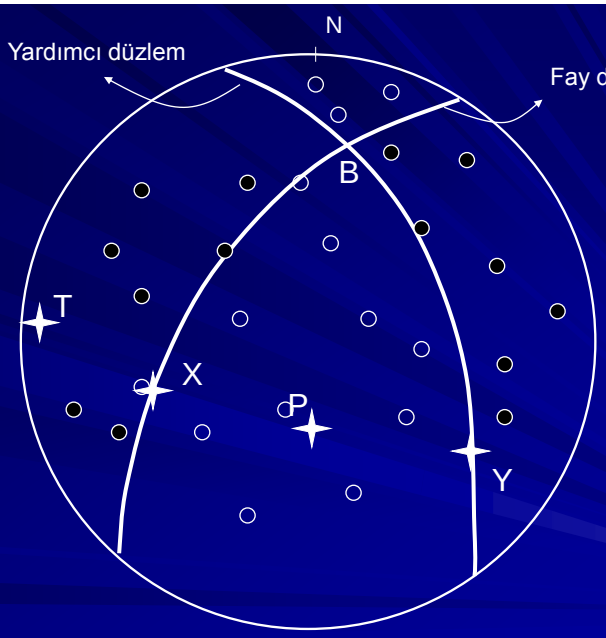


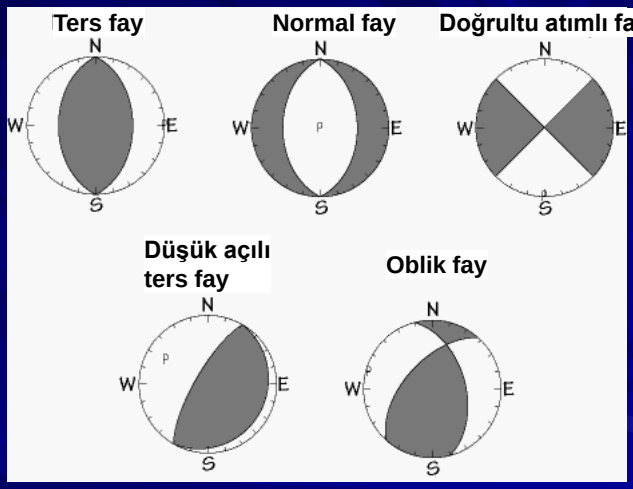


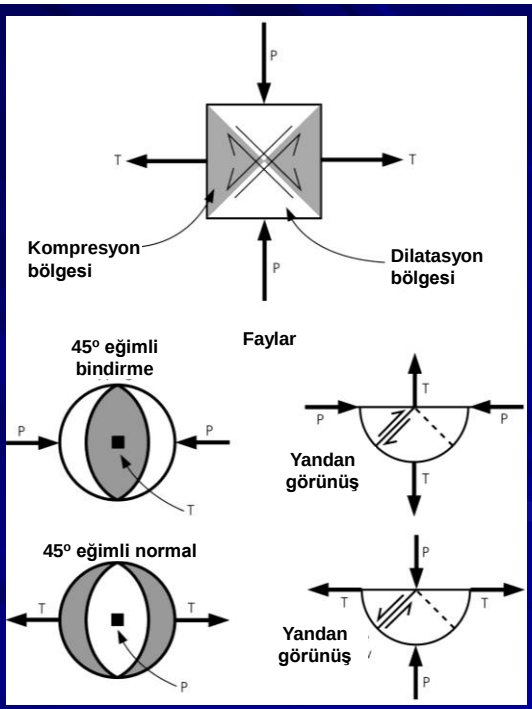
Şekil 2.1 : Faylanma mekanizması bileşenleri.

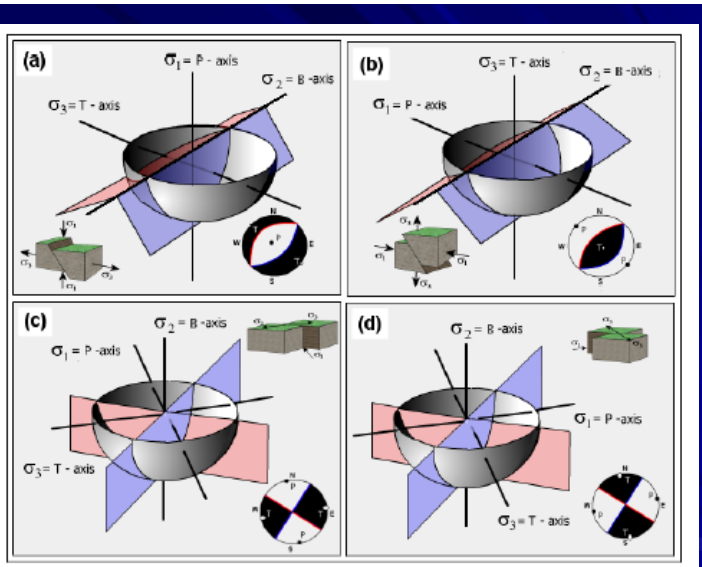
M. Yılmazer


Projection sphere
Horizontal plane
O
Dipping plane
Spherical projection of dipping plane
Projection sphere
T
Stereographic projection of dipping plane
Projection plane
O
Primitive circle
Spherical projection of dipping plane


N
Yardımcı düzlem
Fay düzlemi
B
T
X
P
Y

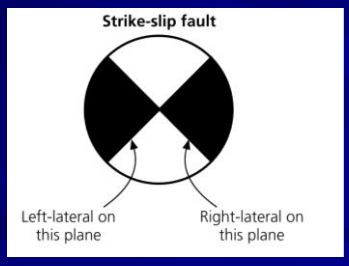

Ters fay
Normal fay
Doğrultu atımlı fay
Düşük açılı ters fay
Oblik fay
N
W
E
S
P

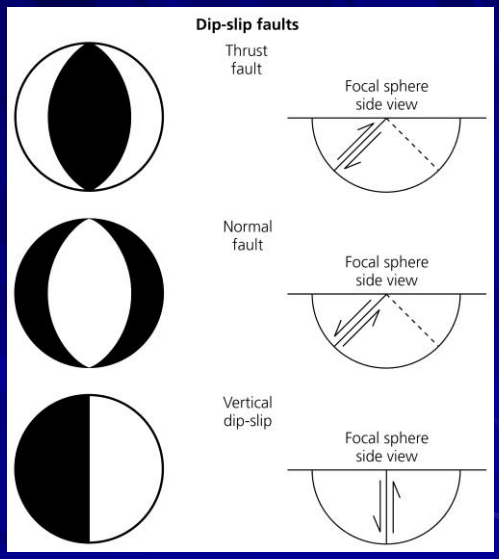

P
T
Kompresyon bölgesi
Dilatasyon bölgesi
Faylar
45º eğimli bindirme
45º eğimli normal
Yandan görünüş
Yandan görünüş

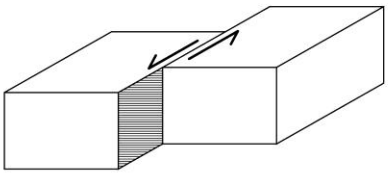


Şekil 2.3 : Gerilme bileşenleri ve P-T ekseni ilişkisi. (a) normal fay, (b) ters fay, (c) sağ yönlü doğrultu atımlı fay, (d) sol yönlü doğrultu atımlı fay (Andresen ve Habesland, 2009, değiştirilerek).

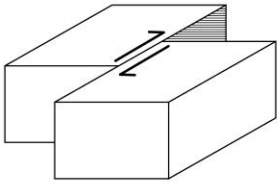
M. Yılmazer



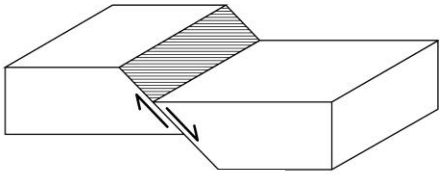




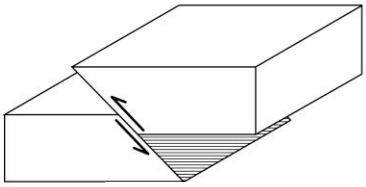
Sol-yanal doğrultu atım
($\lambda = 0^o$)



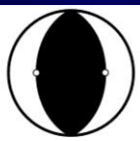
Sağ-yanal doğrultu atım
($\lambda = 180^o$)



Normal atım
($\lambda = -90^o$)



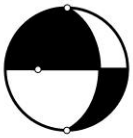
Ters atım
($\lambda = 90^o$)



$\lambda = 90°$ Pure ters

$\lambda = 120°$ Ters, küçük doğrultu atım bileşenli

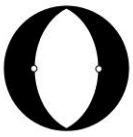
$\lambda = 150°$ Doğrultu atım, ters bileşenli



$\lambda = 180°$ Pure doğrultu atım

$\lambda = 210°$ Doğrultu atım, normal bileşenli

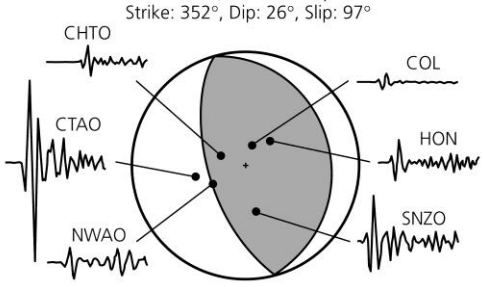
$\lambda = 240°$ Normal, küçük doğrultu atım bileşenli



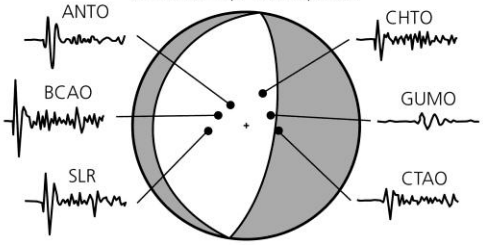
$\lambda = 270°$ Pure normal

Figure 4.2-17: Examples of focal mechanisms and first motions.

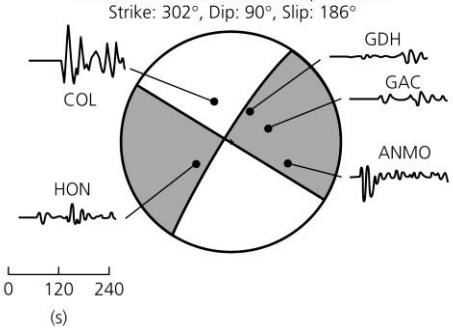
Thrust faulting, Vanuatu Islands, July 3, 1985
Location: 17.2°S, 167.8°E. Depth: 30 km
Strike: 352°, Dip: 26°, Slip: 97°



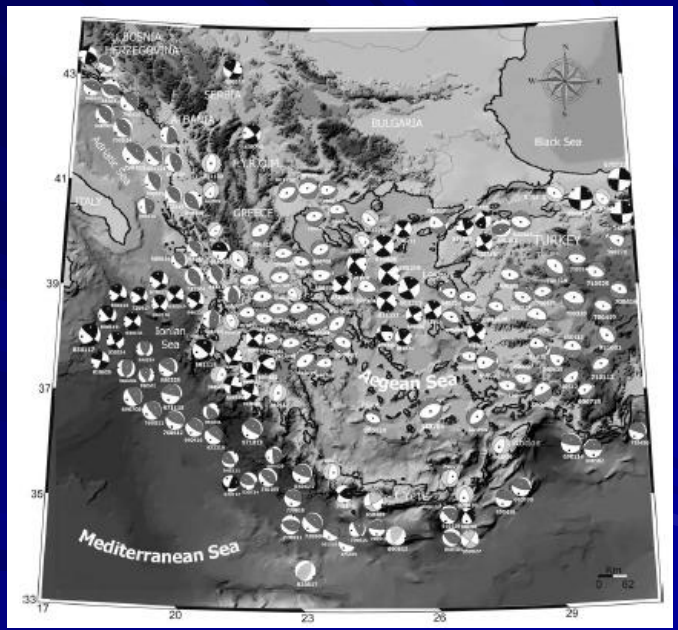
Normal faulting, mid-Indian rise, May 16, 1985
Location: 29.1°S, 77.7°E. Depth: 10 km
Strike: 8°, Dip: 70°, Slip: 270°



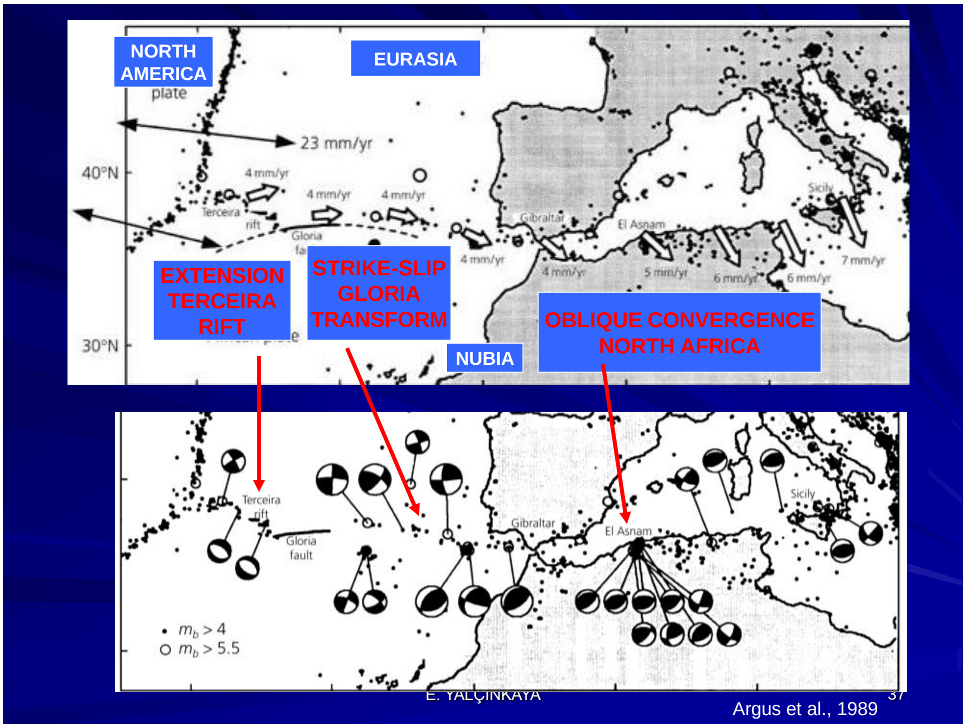
Strike-slip faulting, west of Oregon, March 13, 1985
Location: 43.5°N, 127.6°W. Depth: 10 km
Strike: 302°, Dip: 90°, Slip: 186°

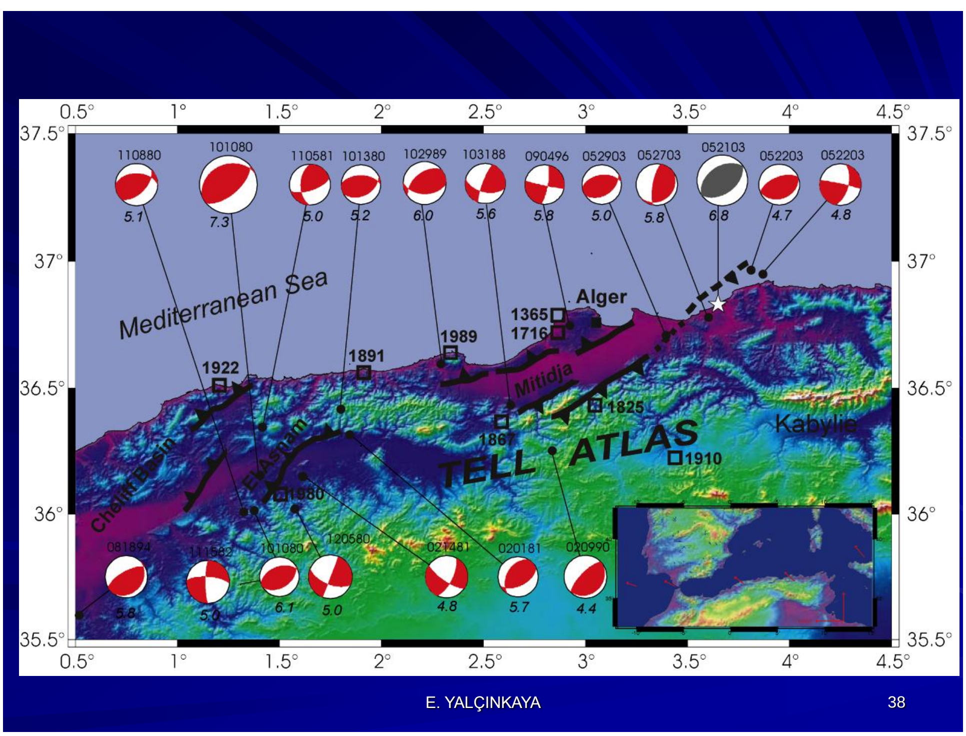


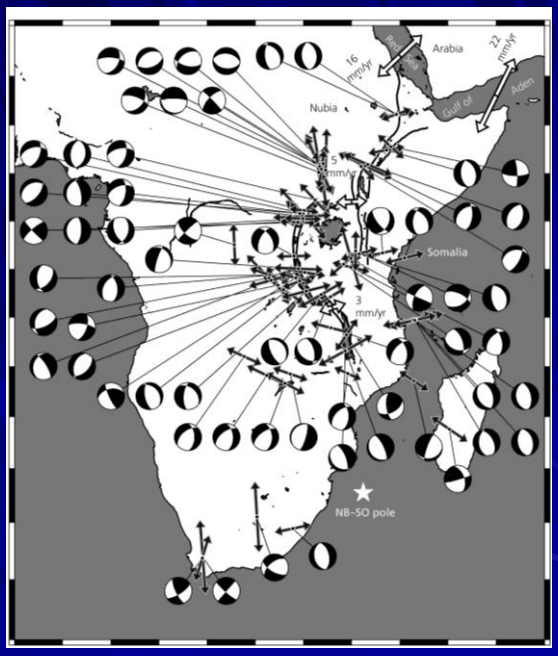
KAYA 35

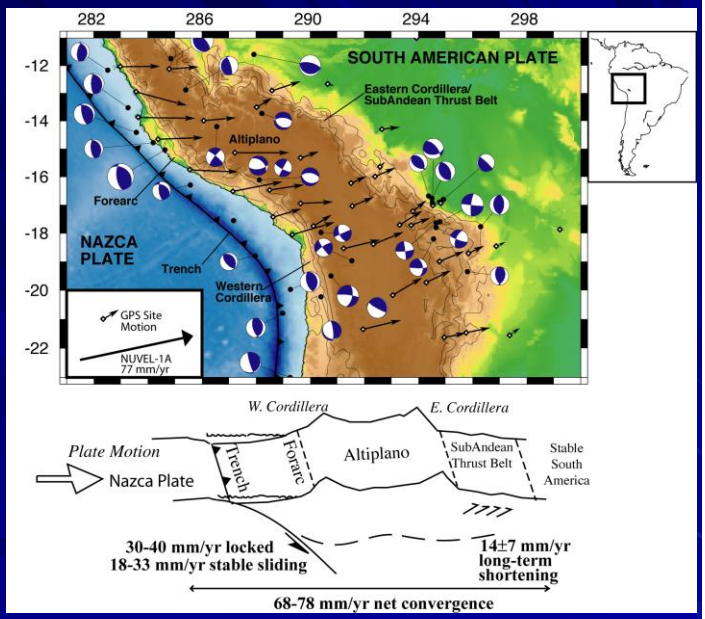


E. YALÇINKAYA 36


NORTH AMERICA
plate
EURASIA
23 mm/yr
40°N
30°N
4 mm/yr
Terceira rift
Gloria fault
Gibraltar
El Asnam
Sicily
5 mm/yr
6 mm/yr
7 mm/yr
EXTENSION TERCEIRA RIFT
STRIKE-SLIP GLORIA TRANSFORM
NUBIA
OBLIQUE CONVERGENCE NORTH AFRICA
$m_b > 4$
$m_b > 5.5$
E. YALÇINKAYA
37
Argus et al., 1989


Mediterranean Sea
Alger
Mitidja
TELL ATLAS
Kabylie
Cheliff Basin
El Asnam
1922
1891
1989
1365
1716
1825
1867
1910
1980
0.5° 1° 1.5° 2° 2.5° 3° 3.5° 4° 4.5°
37.5° 37° 36.5° 36° 35.5°
E. YALÇINKAYA
38


Arabia
16 mm/yr
22 mm/yr
Red Sea
Gulf of Aden
Nubia
5 mm/yr
Somalia
3 mm/yr
NB-SO pole


282
286
290
294
298
-12
-14
-16
-18
-20
-22
SOUTH AMERICAN PLATE
Eastern Cordillera/
SubAndean Thrust Belt
Altiplano
Forearc
NAZCA
PLATE
Trench
Western
Cordillera
GPS Site
Motion
NUVEL-1A
77 mm/yr
W. Cordillera
E. Cordillera
Plate Motion
Nazca Plate
Trench
Forarc
Altiplano
SubAndean
Thrust Belt
Stable
South
America
30-40 mm/yr locked
18-33 mm/yr stable sliding
14±7 mm/yr
long-term
shortening
68-78 mm/yr net convergence

BİTTİ !