California burns
Santa Ana Winds
Conditions for Santa Ana Winds

• High pressure over Great Basin region
  – Why its clear and warm here in Boulder
• Warm conditions in SoCal
  – Low pressure
• Wind moves towards SoCal
• Mountain Barriers
  – Funnel winds, increasing velocity
Stronger at night

- The reason is that during the day, the downslope winds are often opposed by a sea breeze moving off the colder Pacific waters into the hot basin.
- At night, when the sea breeze dies, the Santa Ana winds may down the mountains unopposed.
The Santa Ana winds

Santa Anas are dry, sometimes hot winds in Southern California that blow westward through canyons toward coastal regions. They typically occur from October through March, tending to peak in December, but often spread wildfires in the fall across areas that have gone for months without rain.

1. High pressure in the Great Basin area of Idaho and Utah pushes winds toward low pressure off the Southern California coast.

2. The high-elevation Sierra Nevada Mountains block the winds and force them to the north and south.

3. The desert helps heat and dry the wind as it moves south.

4. As the winds move from higher to lower elevations and squeeze through narrow canyons they are heated further and pushed to higher speeds.

5. The heated, dry air is forced through passes and canyons, including Santa Ana Canyon, from which the wind’s name derives, toward the coast.

Sources: UCLA and UC San Diego research studies

Steve Greenberg / Star staff
Fire Triangle
Fire Risk

- fuels
- terrain
- land management
- suppression
- weather.
Fire and Climate Change
Has climate change resulted in changes in wildfire frequency and magnitude?
Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity

A. L. Westerling,1,2* H. G. Hidalgo,1 D. R. Cayan,1,3 T. W. Swetnam4

Science, 2006
Overview

• Large wildfire activity increased suddenly and markedly in the mid-1980s, with higher large-wildfire frequency, longer wildfire durations, and longer wildfire seasons.

• The greatest increases occurred in mid-elevation, Northern Rockies forests, where land-use histories have relatively little effect on fire risks and are strongly associated with increased spring and summer temperatures and an earlier spring snowmelt.
Fig. 1. (A) Annual frequency of large (>400 ha) western U.S. forest wildfires (bars) and mean March through August temperature for the western United States (line) (26, 30)

Fig. 2. (A) Pearson's rank correlation between annual western U.S. large (>400 ha) forest wildfire frequency and streamflow center timing

Fig. 3. Average difference between early and late snowmelt years in average precipitation from October through May (A) and average temperature from March through August (B)
Fig. 4. Index of forest vulnerability to changes in the timing of spring: the percentage difference in cumulative moisture deficit from October to August at each grid point in early versus late snowmelt years, scaled by the forest-type vegetation fraction at each grid point, for 1970 to 1999 (26)

Conclusions

• Hence, the projected regional warming and consequent increase in wildfire activity in the western United States is likely to magnify the threats to human communities and ecosystems, and substantially increase the management challenges in restoring forests and reducing greenhouse gas emissions.