



What is a katabatic wind, and what is not?

Katabatics are associated with strong, sudden gusts, but they can be confused with other phenomena. Chris Beeson explains

Recently Barry Gray, a *YM* reader from Oman, wrote in to relate an alarming experience that happened while sailing the beautiful, mountainous Musandam peninsula in his Jeanneau Sun Odyssey 36i. After supper they were lying peacefully at anchor when they noticed the wind begin to build. They were clearing away the dishes when all hell broke loose. The boat was blown 180 degrees round her anchor and heeled to such an angle that Barry had to climb up the side of the companionway steps.

He described the winds as 'katabatic' and it seemed to tally with the notion we all have of katabatic winds: sudden, violent and linked to mountains. Then I did some more research and found that katabatic winds are a little more complicated than that.

Katabatic winds are found where there are elevated ice sheets or snowy high plateaux reasonably close to lower, relatively warmer areas, often coasts. At night the plateau radiates heat, cooling the air, increasing the cold, dry air mass and making it denser, until it spills over any natural barriers, like mountain ranges, and gravity drags the cold, dense, dry air

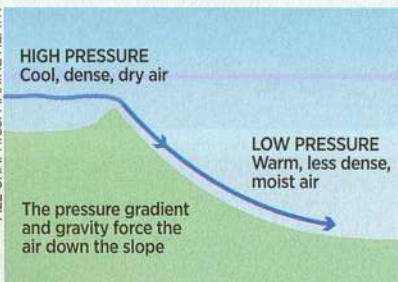
down the slopes. If they have a valley to funnel down, they have been known to reach windspeeds of more than 100 knots.

They often occur when there is no wind, because any headwind may prevent the air rolling downhill, and also because wind tends to mix air masses, raising the average temperature.

With these criteria, it's no surprise that katabatic winds are well known – named, even – in many colder parts of the world, like Antarctica, Greenland, Alaska, Norway and Tierra del Fuego. However they're also found in less obvious places like France, Croatia, even California, and they're there because the right conditions exist.

In France, cold air builds up over the Massif Central then rolls down the Rhône

ALL GRAPHICS: MAXINE HEATH



Katabatic: the forces of gravity and air pressure gradient draw cool, dry air down from high pressure plains at altitude towards low pressure at the coast, funneling in river valleys and through passes. Wind speeds of over 100 knots have been recorded

Anabatic winds

These are in many ways the opposite of katabatic winds. They occur in calm weather and during daytime, perhaps where the sun is shining on one side of a valley.

This heats the air on the slope, which then rises, often forming cumulus above the top of the ridge as the warm, moist air cools. The rising air creates low pressure on the slope, which drags in cooler air from the shaded part of the valley.

The effect of turbulence can be seen on the water in the lee of Culver Down on the Isle of Wight



PHOTO: MATT CLAIBORNE/ALAMY

PHOTO: DAVID PORTER FINE IMAGES/ALAMY

There will be very strong downdraughts under the roll cloud that marks the leading edge of this thunderstorm in the Bahamas



This is the Bora, or Bura, a northeasterly katabatic wind, in full cry off Krk Island, Croatia



PHOTO: IVAN BATINIC/ALAMY

valley into the Golfe de Lion. It's known as the Mistral and it's often associated with high pressure over Biscay and low pressure over the Ligurian Sea, as the opposite rotations of the systems feed wind off the plain and into the valley.

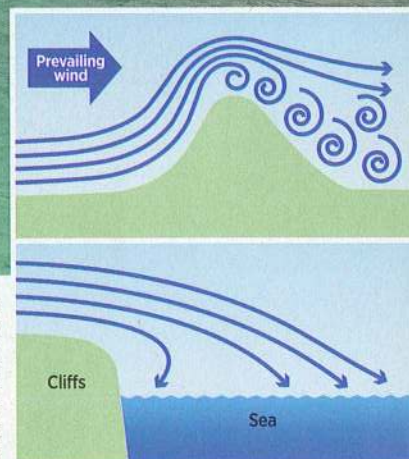
The katabatic wind in Croatia is known as the Bora, or Bura. A cold, dense air mass creates high pressure over the high Hungarian Plain until the air mass spills through passes in the Dinaric Alps and rolls down to lower, warmer coastal elevations at lower atmospheric pressure.

In California, cool, dry, dense air gathers, creating high pressure over the western side of the Great Basin desert, until it reaches gaps in the Sierra Nevada

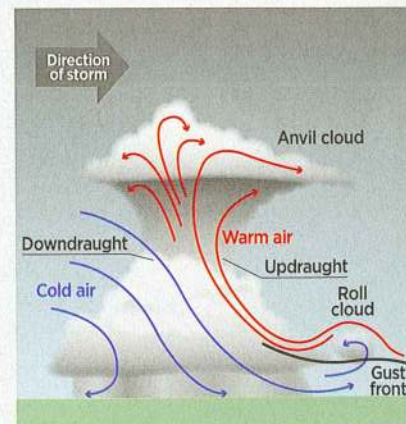
mountain range. It then rolls downhill towards warmer, moister, lower pressure conditions over the Pacific to create what are known as the Santa Ana winds.

When is a katabatic not a katabatic?

Technically, we do get katabatics in the UK. As hill slopes cool overnight, the air on them cools and slides downhill. However, we don't get any worthy of a name, as we lack the cold, high plains. We have, though, all heard reports of similar sudden, violent winds, often near cliffs or at night. Some of us have experienced them. There are two possible explanations: turbulence or downdraughts (see graphics). ▲



Turbulence: if you are in the lee of a cliff or a hill in an offshore breeze, the wind will become turbulent as it blows over the top. This creates chaotic, turbulent winds that seem to blow from every direction at once



Downdraughts: we began with a story about a reader in Oman. In part of his story he mentions noticing distant lightning in the build-up to the tremendous blast of wind that span the boat around. This suggests that it was a downdraught, under a thunderstorm

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