Natural Hazards in the Alps

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Natural Hazards in the Alps

The story

Autumn festival

Berti is preparing everything for an autumn festival. The tree in front of his beaver lodge is decorated with Chinese lanterns and a small dragon that he made. Berti is also preparing a campfire. His friend Killian is helping him to do that. First, they remove all the twigs and fallen leaves from the spot. Then they set up big rocks in the shape of a circle. In the middle Berti builds a pyramid from some twigs he found. They want to have a barbecue with corncobs and potatoes wrapped in aluminium foil and they want to roast some chestnuts. He also invited two other friends.

Hanne Hermelin and Randy Raccoon arrive. They are very excited about the festival.

After greeting everyone, Hanne asks, “Do you want to light the campfire? Is that not forbidden here on the forest edge?”

Berti answers, “Yes, that is right! But we asked the chief firefighter and he allowed us to do it because it has been raining the last few days.”

What just fluttered by?

The sun is going down and it is gradually getting darker. The moon is shining brightly in the sky. Berti lights the campfire and soon after the fire starts to crackle. Everyone wraps a potato in a foil and throws it into the embers. Then they grill the corncobs over the fire after sticking them on long sticks. Randy puts the chestnut on a grilling grid and puts it over the flames.

“This tastes good,” says Killian.

“I am so full that I can’t even sit straight anymore,“ moans Berti and falls onto his back.

He looks into the dark sky.

Suddenly Berti jumps up and exclaims, “Did you also see the bats?”

“No! Where?” asks Hanne.

“There they are!” notices Randy.

Now everyone can see the bats quickly fluttering by in the night sky.

“Hey Kilian, don’t you want to race with them?” asks Berti.

“Ha, ha,“ growls Kilian, “I don’t fly at night!”

“Kilian the Batman,“ teases Randy.

“Where do bats spend the winter?” asks Hanne.
“I heard they sleep in caves,“ answers Berti, “there they hang upside down on the cave ceiling.”
Kilian knows more, “On the other side of the shore of the lake, in the steep face of the mountain, there is a cave. This must be where the bats stay in the winter.”
“Great!” calls Berti, “Let’s visit the cave tomorrow?”
“Let the bats sleep in peace,“ urges Hanne, “besides that, I do not like the darkness and cold caves.”
“But that would be a great adventure,“ says Berti trying to persuade his friend Hanne, “we will also be very quiet.”
Then Hanne nods her head and says, “I am curious, but I will not go far into the cave!”

A dangerous way up

The next morning everyone wakes up early. They are all excited about the things that await them in the cave. Berti takes his backpack. In his backpack there are his are binoculars, bandages, a compass, two flashlights, a pocket knife and a water bottle.
"We will need a rope too," says Randy.
Berti gets one out of his box and then they dash off. They walk to the shore of the lake. There they throw their belongings into a boat and start paddling. The water is very clear and there are a lot of fish swimming around in it.
The steep cliffs tower up impressively. Suddenly, a small stone falls from above and into the water. The mountain seems to be behind them, because even bigger boulders from the steep face around rolling down now. The boulders fall closely next to their boat and into the water.
Randy yells, “Quick, let’s get away from the steep face!”
“I hope that no more stones fall down!” says Hanne.
Berti paddles with stronger strokes into the middle of the lake. Luckily, no further stones have fallen from the mountain. Now they feel safer.
Then Kilian asks, “Can you see the cave?”
Berti says, “Luckily, the cave is not located near the rockfall.”
Everyone nods, and they decide to explore the cave anyway.
It doesn’t take long until they reach the shore. They climb out of the boat and tie it to a little bush nearby. There is a narrow hiking path that leads to the cave.

Berti suggests, “Just like real adventurers, we should tie ourselves to each other with the rope.”
Berti, Hanne and Randy tie the rope around their bodies. Then they set off with a thirst for adventure. Kilian flies ahead and watches the mountain.

Crash

“Careful!” calls Kilian. “There is a large stone on the path.”
Everyone climbs over the stone carefully.
“We almost did it”, calls Kilian, “only a few meters left.”
“Don’t make us nervous!” scolds Randy. “When climbing a mountain, you must be very concentrated. We are only safe once we have reached the cave.”
Then Kilian yells, “Stop! Stones are falling.”
Suddenly stones rumble down the slope. Everyone stands still. They press themselves against the steep face. A piece of rock falls onto the path in front of Berti and rolls down the slope.
Now gravel and sand trickle down the mountain and patter onto Berti's shoulder. He is frightened! He takes a careless step to the side and slips.
“Hold on!” Kilian crows.
Berti clings to the boulder. Hanne and Randy brace themselves against the taut rope. Berti can pull himself up. Together they did it. Berti has safely returned to the path again. They have finally reached the cave.
“Pffft!“ Berti whistles through his teeth. “That was close."
"I told you,“ Hanne scolded, "mountains and caves are dangerous."
"Are you hurt?" Randy asks the pale-looking Berti.
“No, everything is okay,” replies Berti quietly.
"Is everything okay with you?“ Berti asks the two girls. "Thank you for holding me."
The two nod. Then Randy says, "Let's take a short break first."
They sit on the rocky ground and drink water. They enjoy the great view.

“Look!” exclaims Berti. “Down there lies my beaver lodge.”
Then Hanne says, “Above lies the meadow where my home is.”
“You can also see the big oak, the tree on which my house is!” shouts Randy Raccoon.
“Look up, there is the sky. This is my home!” jokes Kilian.
At their feet they see the turquoise blue lake on which they rowed their boat. Opposite from the cave, the mighty mountains are majestically enthroned.

They are all more than 3000 meters high and there is already snow everywhere on the peaks.
“This is the home of our friend Stani Steinbock,” says Berti, "unfortunately he couldn't come to the party yesterday."
What they don't see, however, are the huge thunderclouds that are building up over the summit behind them.

Total Darkness

“Are you ready?” calls Berti while being excited about the adventure. “Let’s go into the cave and look for those bats!”
Slowly, they walk into the cave. It gradually gets darker and they have to turn on their flashlights. However, they cannot see any bats. Suddenly they hear a dull rumble.
Hanne flinches and says, "What was that?"
“Quiet!” shouts Kilian.
They stand there as if rooted to the spot and listen. Now it is very quiet again.
Berti says, "This dull growl came from inside the cave".
"Dragons don’t exist anymore!" whispers Randy.
Kilian laughs, “Roar! Grrrr. I am a flying dragon!"
“No, of course not!” says Hanne, shaking her head.
"Maybe the noise is coming from outside," says Kilian, "and we only hear the echo."
“Let’s go back,” suggests Hanne.
“Yes, we should return to the entrance.” says Berti too.
Disappointed because they couldn’t see the bats, they return to the entrance. Yet before they could reach the cave entrance the cave starts rumbling and trembling. They stop and stand still. Everywhere they hear rumbles, cracks and crunches. In front of the cave entrance they can see heavy stone blocks falling into the depth.
Then the first stones patter into the inside of the cave. More and more large and small boulders fall into the cave. The friends quickly flee to the back of the cave.
The loud noise of the falling stones roars and echoes in the cave and a huge cloud of dust fills it. Then everything is silent and dark.

Buried

Then the entire entrance is covered with stones. Only a weak, thin beam of light falls through a narrow crack.
"We're trapped here!“ Randy calls desperately.
“We will starve and die!” Kilian groans.
"Stop whining!“ says Berti sternly. "Come! We will go to the buried entrance. That's where light comes through. Maybe we can climb out there."
Slowly and carefully they make out their way to the entrance in the light of the flashlight by touch.
Kilian mentions, "Except for a small opening through which a tiny ray of light falls, the cave is walled up."
"I will climb up and see if I can make the hole bigger," suggests Berti.

Berti climbs up on the stones. Once at the top, he tries to push the top stone out. It wobbles, but he cannot push it away.
"Can you please help me Randy?" calls Berti.
Randy climbs up to Berti and together they can push a stone away. Finally, it is getting brighter again in the cave. However, none of the other stones can be moved. The opening is too small for Berti, Randy and Hanne. They are trapped.
But Kilian has an idea, “The hole is big enough for me. I will try to find Stani Steinbock. He knows all the mountains here. Maybe he can save us.”
Everyone thinks it's a good idea and Kilian takes off.

Rescue

Kilian is lucky. His friend Stani is very close. He saw the huge rockfall. Kilian quickly tells Stani what has happened. Now dark thunderclouds are also gathering. The first lightning flashes and heavy thunder rumbles.
Stani knows the cave and says, “There is a second entrance into this cave. It's higher up. It is very hidden. Very few know it. Let's get on our way because a heavy rain could flood the cave.”
Now it is starting to rain a lot. Again and again lightning flashes and thunder growls. Stani skillfully jumps over the rocks. Kilian flies closely behind him.
“This is a particularly huge summer thunderstorm!” He shouts to Kilian. “Now I just have to cross the bridge over the river and then we're at the entrance of the cave.”

He jumps down the slope to the stream. However, just as he reaches the bridge, it is destroyed by the wild water of the stream.
“I can't jump over the stream at this point,” he calls out to Kilian, “but further up ahead the water flows through a narrow canyon. I will be able to jump over there.”
Stani arrives at the canyon and looks down into the wild water. Then he jumps. Done!
“The entrance is over there,” says Stani.
Kilian rushes off to take a closer look at the opening.
“You must be an expert of mountains if you know that this small gap is a cave entrance,” says Kilian stunned.
Stani smiles, “Come on, let's go inside. Our friends will be waiting for us. "
"Hm,“ Stani grumbles, "Rainwater is already leaking inside."

“Is that dangerous for our friends?” asks Kilian.
“It could flood the cave,” Stani mentions, “then it gets uncomfortable in there. Let's hurry up! "
Down it goes for them, through a narrow corridor. After many turns, they finally reach the trapped friends. Fortunately, this part of the cave is still dry.
Everyone cheers and hugs Stani and Kilian.
“No time for conversation!” Says Stani sternly, "We have to get out of the cave quickly before it is underwater."
They are ready to leave the cave. Again and again they have to wade through knee-high water. But finally they get out of the dangerous cave. A strong thunderstorm is still rumbling outside.

The wind is very strong and large raindrops hit the floor.
"We have to hide in the forest over there!" says Stani. “In there we are safe from the lightning."
The lightning is bright and the thunder very loud. The whole floor is shaking. The friends are frightened and are standing still. Lightning rushes from the sky and splits a tree. Seconds later the conifer is on fire.
“The heavy rain will soon extinguish the fire,” says Stani, “let’s go quickly into the forest! Otherwise we will also be struck by lightning. "
Now they are in the thick forest.
"There is a small cave nearby," says Stani, "it will offer us protection against the rain and the lightning."
Soon they will reach the cave.
"Quick, get inside!" calls Stani. "We are safe in there!"

Completely soaked, they go into the cave.

“A thunderstorm can be pretty dangerous,” says Hanne.
Berti says, “When thunderclouds are in the sky, everyone has to get into safety immediately. You shouldn’t wait until it starts to rain. "
"Or even until it starts thundering and lightning," adds Randy.
“Today it was really dangerous!” says Stani. “Being rescued from the cave brought us into the middle of a violent thunderstorm. Remember, individual trees and the edge of the forest do not offer any protection! You must walk into the thick forest."
“I also have to fly into the forest immediately when there is a thunderstorm,” adds Kilian, “there you should make yourself as small as possible between the trees.
"When you are in the open countryside, you should crouch in the thick forest," says Berti.

Roaring River

The next morning Kilian wakes up his friends, “Come on, get up you sleepyheads! It stopped raining! Outside the sun is shining again! "
The sleepy friends stretch their bodies. They walk out sleepily from the cave. The sun shines through the treetops and the air smells fresh. Berti takes a deep breath of the cool, fresh forest air.
Then Berti calls, "Do you hear this loud noise too?"
"Yes! It must come from the river!” says Stani.
"Come on, let's run over," says Kilian and flies off immediately.
His friends follow him curiously and run across the wet forest floor. The water forcefully rushes through the canyon, over which Stani jumped yesterday. The water carries stones and pieces of wood and transports them into the valley.

"My goodness! What happened to the river?” says Kilian, very shocked. "The lovely little stream has turned into a real monster."
"You jumped over it?“ asks Berti in disbelief.
“Yes!” Stani smiles and replies. “What should I have done otherwise? I had to save you from the cave."
“That was really brave of you,” says Hanne surprised.
Hanne, Randy and Berti are happy that Stani is such a brave friend.

Suddenly Berti calls out, “The river has become a rushing body of water. In such a big storm, high quantities of water can carry large amounts of rock rubble, wood or entire tree trunks from the forest with it. Maybe it damaged my lodge?"
Berti takes a short break, and then he shouts, "I have to go down to the valley and to my beaver lodge immediately!"

Stones, Gravel and Mud

They hurry along the river, through the forest and into the valley. Berti is very nervous and wants to run to his damaged beaver lodge as fast as possible. As they come out of the forest, they can see the valley. Berti’s lodge is completely flooded. They stop and are worried.
On the riverside everything is flooded. Brown water, mud, stones and branches lie in the fields, meadows and on the streets.
Hanne is the first to talk, "Oh my dear, that's terrible!"
“Oh, no!“ everyone says, "Everything is under water and muddy!"
Berti only looks at his lodge.
"There! Look at my beaver lodge!” he exclaims in horror. “My dam is gone. I can't see my lodge anymore. I must go to it immediately!"

They walk across the wet meadows to the stream. Finally, they reach Berti’s beaver lodge. Everything looks like a huge lake of mud. There is water still flowing from the mountain. Berti's lodge is buried under a fallen tree. The dam for his small lake has been completely torn away.
Berti starts crying.
Then he says in a sad voice, "I'm homeless" Now I have to sleep outside!"
Then he slumps into the wet, muddy grass. He stares sadly at his ruined home.
“Don't be sad, Berti! We'll all help you to repair it,” Hanne comforts him.
“Yes, right,” says Stani, “when the water has gone away, we will all rebuild your home together.”
Berti is thankful and nods.

“Should I start repairing my home right away?” asks Berti.
"No! As long as everything is still flooded you cannot start fixing it,” says Stani. "only if there is less water here, we will be able to start."
“I think you're right!” says Berti, “We also have to wait until the shore is dry.”

Randy invites Berti, “I have my tree house not too far from here. You are welcome to stay with me until your lodge is repaired."
The next days are warm and sunny, the water in the river flows calmly again. The sun has also dried the shore.

Now the friends get to work. They help Berti to repair his beaver lodge. After they have finished, Berti thanks everyone and says, "It's wonderful to have friends!"

The End

Natural hazards in the Alps

know how

A moving Mountain

Stones, rocks and boulders in motion
Experts have different names for falling rocks depending on the size of the rocks:

- Rockfall
- Rock avalanche
- Rockslide

What is a rockfall?
A rockfall occurs when small stones detach from a rock face and fall down. These rocks can have many different sizes. Some can have the size of a tennis ball. Others can be as big as a small van.

What is a rock avalanche?
During a rock avalanche large rocks detach from a mountain face. While falling down the mountain face, the large rocks crash against the mountain face and break into smaller rocks.

How big can a rock avalanche be?
A small rock avalanche can have the size of a bus or small mountain lodge. That would be about 100 m^3 of stones.
A big rock avalanche can have the diameter of a soccer field. This means that its height and length both can be 100m. That would be 1 million m^3 of stones. To clean away this amount of stones you would need 20,000 fully loaded trucks. Geologists call even larger amounts of stones rockslides.

Why are there rock avalanches?
There are many things that cause rock avalanches. Wind, water and the alternation of frost and thaw are the main reasons. They cause the rocks to crack and split. Once the rock is loosened from the mountain face, it falls down.
The type of rock also plays a role. Some rocks are more brittle than others are. In addition, the steepness of the mountain face is important. If a mountain face or slope is very steep, it is more likely that pieces of stone fall further into the valley. When the mountain face is less steep, the stones do not roll down so fast. They might even stop rolling if there is something in their way.
Rockfalls, rock avalanches or rockslides occur on almost all steep slopes in Austria. How often they happen depends on the type of ground and on the steepness of the landscape. They occur mainly in high alpine areas of Austria.
"Alpine" means "mountainous". The highest parts of the Alps are called the high mountains.

The speed of falling stones
When stones fall, they usually do so at a very high speed. Their speed depends on several factors.
The **steepness of the mountain** face is of course one of the most important influences. The steeper it is, the faster the stones fall down.
The type and **structure of the ground** also influences the speed. Softer ground can slow the stones better than harder ground.

If there are trees and bushes in the way of the falling stones, the stones are also slowed down.
Stones usually reach speeds of over 100 km/h (that's about 30 meters per second). In some rare cases, for example when stones are in free fall, even higher speeds can be reached.

Landslides

What is a landslide?

A landslide is when the soil layer separates from the subsoil and starts to slide downwards. Landslides are mainly caused by gravity, but rain can also cause them.
The size of a landslide can be between a few m^2 and a few km^2.

How fast is a landslide?

The speeds at which the soil layer moves downwards can range from a few centimetres per year to over 80 km per hour.
Landslides are completely natural processes that have existed for millions of years.

When does the ground begin to slide?

Gravity pulls the soil layer down on a mountain slope, however, on the other hand, it also adheres to the solid surface.
Sometimes the weight of the ground changes. This can happen when it rains heavily. Then the ground becomes heavier, and it can slide into the valley.
The soil layer is usually stuck to the solid underground. However, if it rains too much the soil layer soaks up the water and becomes too heavy. Then gravity can pull it downwards and let it slide into the valley.

Large masses of water

Torrent

A torrent is a steep mountain stream. Usually, it flows down a mountain as a peaceful stream. However, when the snow melts in spring, the stream fills with large amounts of the melted water.
In addition, after a lot of rain, the stream will fill up with large amounts of rainwater. This increase in the volume of water can turn a peaceful stream into a strong torrent.

The Earth's Water Cycle

The earth is known as the blue planet because three quarters of it are covered by water. All living beings need water to exist.

Water is always in constant movement. We call this movement: The Water Cycle.

When the sun warms up the earth's surface and seawater evaporates. The evaporated water is called vapour or steam. The warmer vapour then flows up into the sky until it enters into the earth's cold atmosphere. The vapour gets cooled-down, condensates and transforms into clouds. The clouds are actually made up of very small water droplets. The wind allows the clouds to travel through the sky and grow. They grow because they merge with other clouds and collect more and more water droplets. When the droplets combine, they turn into bigger drops of water. You can see this because the clouds grow big and dark. When the drops are too big for the cloud to hold them, they fall to the ground in the form of rain. This is what we call precipitation.

Sometimes, in winter the air is so cold that the drops freeze while they are falling to the earth's surface. This is called snow or hail.

The rain or snow is then collected in lakes and rivers, or it seeps into the ground to create subterranean currents. These currents or streams of water then flow back into the sea and the whole water cycle starts from the beginning again.

This water cycle moves large amounts of water:

Every year, around half a million cubic kilometres (km^3) of water evaporate because of the sun's heat radiation.

About 400,000 cubic kilometres of that water then precipitate and fall back into the sea and ocean. About 100,000 cubic kilometres of rain and snow fall onto land and seep into the ground. A cubic kilometre is a cube with an edge length of one kilometre.

Water shapes the landscape

Rainwater flows back into the sea via subterranean currents such as the streams and rivers. The flowing water is so powerful that it can tear away hard rock, transport sand as well as debris from the mountains and carry it all to the plains and the coast. In the event of a storm or flood, it can also trigger off natural disasters, just like a landslide. In this way, water shapes the landscape of the earth.

Invisible water becomes visible
Warm air contains water vapour. When the warm air cools down, the water vapour turns back into liquid water droplets. This is called condensation. The same thing happens with the moisture in our breath on cold days.
In the same way, fog is formed on cold nights.
Clouds are formed when warm air rises and cools down in the earth's atmosphere.

Humidity
The invisible water in the air is what we call humidity. When the humidity levels are low, we can feel it on our own body. Our skin becomes dry and the mucous membranes in our nose, mouth, throat, and lung dry out. This causes many people to cough.
We experience high humidity on warm, rainy summer days. The air becomes saturated with water and feels damp. Depending on the temperature, the air can absorb different amounts of water. Warm air can absorb more water than cold air.
We speak of "saturated air" when the air cannot absorb water any more at a certain temperature. Then your skin or laundry cannot dry either. The little water droplets in the air just stick to every surface.

What is a thunderstorm?
A thunderstorm is heavy rain with lightning and thunder. Rain and thunder are both created in a huge, dark thundercloud.

Thundercloud
Meteorologists call thunderclouds "cumulonimbus". They are massive and dark. Since they grow very quickly, they can look like a giant cauliflower. They're the biggest clouds that exist.
Usually, rain falls from a thundercloud however also hailstones can fall from it. Most of the time when it rains it's because of a thunderstorm.

The creation of a thundercloud
Every day around 40,000 thunderstorms occur on earth. They are formed when the sun heats up the ground on humid summer days. Then the hot,

humid air rises and a small thundercloud develops. This little cloud then quickly grows into a gigantic 10-kilometer-high cloud mountain. At this altitude, the cloud enters our atmosphere where the temperatures are below minus 40 degrees Celsius.
Because of the low temperature water droplets freeze into ice crystals. These ice crystals create a layer of ice crystals. Just below the layer of ice crystals there is a layer of water droplets. These water droplets are constantly growing bigger and bigger.

Strong winds within the cloud rub water droplets and ice crystals against each other and charge them electrically. The thundercloud is born.
The water droplets have become so big and heavy that they fall to the ground as rain. The first lightning bolts are discharged within the cloud. However, they can also discharge between the cloud and the earth's surface. A flash of lightning heats the air so much that the air expands explosively. This creates a loud bang called thunder.

Thunderstorms
Thunderstorms in the mountains are very dangerous because they are often only seen too late. Thunderstorms are very dangerous for hikers and mountain climbers. Even on easy hikes dangerous situations can suddenly occur, so always look at the weather report before going on a hike and ask people that live there!
But thunderstorms are not only dangerous in the mountains. Even when you are at a lake or in a swimming pool. Always watch the clouds in summer!

Signs of an approaching thunderstorm:

- Dangerous storm clouds can look like a giant cauliflower or cotton candy. These clouds quickly grow into huge towers of clouds.
- Usually it is also very windy
- Lightning and thunder

Correct behaviour during a thunderstorm
Keep calm - do not be afraid and panic!

A lightning strike can cause severe burns, paralysis or loss of consciousness in a person. In fact, a lightning strike can also be fatal.
When you are in the mountains, it may be that, because of the height, you are not under the thundercloud but instead in the middle of the thundercloud.

• If there is a forest nearby, go deep into the forest. Don't stop at the edge of the forest.
• Crouch as low as possible in the “squat position” on the floor.
• Find shelter in a mountain hut with a lightning protection system.
• Go into a large cave

Wrong behaviour during a thunderstorm

- Do not walk
- Do not run
- Do not lie down flat on the ground
- Do not look for protection at the edge of the forest or under individual trees
- Do not ride your bike
- Do not ride a horse
- Do not hold onto metal (for example like metal poles)

Lightning

A cloud is made up of many small water droplets and ice crystals. Inside a thundercloud, the air is in motion and the water droplets and ice crystals are swirled around. They crash and rub against each other within the cloud until they are electrically charged. This electricity creates huge sparks - which we know as lightning.

Thunder

A flash of lightning heats the air to up to 30,000 degrees Celsius in a fraction of a second. This makes the air expand explosively which then lets off a very loud bang, known as thunder. 30,000 degrees Celsius is five times as hot as the surface temperature of the sun!

Why does lightning strike?
The lightning looks for the shortest possible path through the air. That is why lightning tends to hit tall buildings or trees!
This is usually not straightforward and therefore the lightning bolt looks jagged and branched. The vast majority of lightning discharges takes place between the clouds themselves and never reaches the ground!

How far away is the thunderstorm?
The sound of thunder is much slower than the spark of lightning, so we hear the thunder later than we see the lightning. Count the seconds between lightning and thunder. Divide the number by 3. The result is roughly the distance that the thunderstorm is away from you, in kilometres.

Example: You count 9 seconds between lightning and thunder: 9 : 3 = 3. The thunderstorm is only 3 km away.

Precipitation
In meteorology, precipitation mainly means the water that falls on the earth in liquid or solid form. Most people know the most common types of precipitation: rain, drizzle, sleet, snow and hail.

Rain
As a prerequisite for rain the air around a cloud has to cool down. The small water droplets in the cloud are then pressed closer together. They merge to form larger drops of water. At some point they are so heavy that they fall down to the earth's surface as raindrops.

Hail
Sometimes when large raindrops develop in the clouds, they can be torn up again and again by strong winds. Because the temperature is very low up in the atmosphere, the raindrops freeze into balls of ice. They get bigger and bigger until the cloud cannot carry them any longer and they fall to the ground as hailstones
Hail usually occurs in high thunderclouds with strong winds.

Snow

At very low temperatures, ice crystals develop in the clouds. These crystals combine to form snowflakes and fall to the ground. Each snowflake is unique, but they are all hexagonal.

What is flood?

If large amounts of rain fall in a short period of time, the water level in the river or stream rises above normal.

What is a mudslide?

A mudslide usually occurs on steep slopes in the mountains. Heavy rainfall causes large amounts of water to flow down the steep terrain. The water washes rubble, rocks and earth into the valley. Rough stones, big boulders, tree branches and even whole tree trunks can be carried away. Mudslides flow into the valley at a rapid speed of up to 60 km/h. They mostly flow down into the valley in pre-existing streambeds or slope furrows. However, the huge masses of water can also dig new water paths in the area. The raging and destructive flow of a mudslide usually ends at the hanging wall, where the slope becomes flatter. This is where the material stops moving and gathers. If mudslides hit roads, rails or buildings, they can cause enormous damage and destruction.

Protective measures

Protective measures at the torrent

Can I protect myself against the dangers of a torrent? Yes and no.
The best protection is to avoid those dangerous areas.
Areas where people live or near houses, factories and roads are usually safer as well.
What other protective measures are there?

Biological measures

Some of the most important biological measures are taken by forestry. Forestry includes all activities that help to keep forests and nature

healthy. Shrubs and trees are planted so that their roots help to secure slopes. Additionally, old, weak and dry trees are removed from the catchment area. There are many other biological measures that can be taken.

Technical protective measures

These are structures made of wood, steel, concrete or stone and earth. They help to prevent or reduce the occurrence of disasters. However, they also protect people and their houses against the forces of nature (floods, avalanches or mudslides). With the technical measures one can better control the water masses. They help to redirect the flood away from the place and maybe into another stream.