

Lahar danger of Kliuchevskoy volcano massif (Kamchatka)

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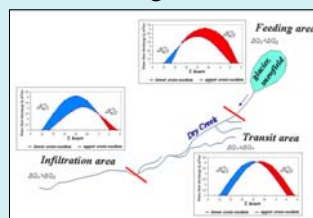
Among the processes accompanying volcanic eruptions in Kamchatka, **lahars (volcanic mudflows)** are the most dangerous events for utility structures and local population. Population aggregates surrounding Kliuchevskoy volcano massif are situated far away from volcanoes (for example Kliuchi settlement is in 30 km from Kliuchevskoy volcano) but lahars can cover a distance of 30 km and more.

In Kamchatka lahars are formed as **the result of intensive snow and ice melting** caused by solid discharges of scorching material. Movement of such flows saturated with volcanic ash, slag and blocks of lava occurs with **velocity about 60 km in hour**. It can lead to extensive damage and victims.

Lahars power depends on the following

factors:

- Area of catchment basin;
- Snow cover depth in catchment area;
- Relief;
- Deep gullies presence



Lahar damage to human activities:

- In 2005 lahars destroyed logging at the foot Kliuchevskoy volcano (northern slope);
- Occasionally lahars from Kliuchevskoy volcano demolish segments of roads;
- There are several mentions of human victims;
- During high-water periods vehicles regularly get stuck at dry creeks valleys which cross the roads;
- Four scientific stations were destroyed on the slopes of volcanoes of Kliuchevskoy massif.

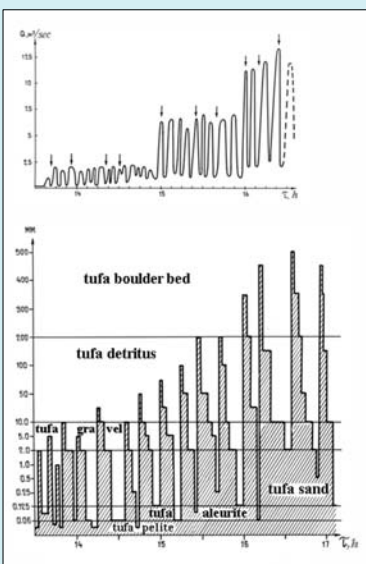
Lahars of Kliuchevskoy volcano massif



Main paths of lahars are "dry" creeks' valleys



Lahar on the Krytenkaya dry creek (Kliuchevskoy volcano), 16th February, 2005.



Failure of scorching lava on the volcano's slopes is the reason of destructive lahar forming

Flow fluctuations are shown in:
- daily
- within-year
- and annual hydrological regime



The most active volcanoes of Kliuchevskoy massif: Kliuchevskoy and Bezymianny

Lahars characteristics of Kliuchevskoy volcano top eruptions 1985-2008

| Eruption, year | Date of lahar formation | Course of lahar (dry creek valley) | Flow length, km | Area of deposition, km ² | Average thickness of deposits, m | Volume of deposits, km ³ ·10 ³ |
|----------------|-------------------------|------------------------------------|-----------------|-------------------------------------|----------------------------------|--|
| 1985 | December, 2 | Syhaya, Krytenkaya | 30 | 1,2 | 0,6 | 0,7 |
| 1993 | July, 19 | Kirgurich, Krytenkaya | 33 | 2,5 | 1,0 – 1,5 | 2,5 |
| 1994 | October, 1 | Kirgurich, Krytenkaya | 29 | 6,5 | 1,5 | 9,8 |
| 2005 | February, 1 | Krytenkaya | 25 | 1,8 | 0,5 | 1,4 |
| 2007 | May, 14 | Kirgurich | 35 | 1,2 | 0,5 | 0,6 |
| 2008 | December, 9 | Syhaya | 25 | 1,1 | 1,0 | 1,1 |