



# Grimsvötn eruption

## *Report*

EARLINET, the European Aerosol Research Lidar Network, is a coordinated network of stations that make use of advanced lidar methods for the vertical profiling of aerosols. It was established in 2000, with the main goal to provide a comprehensive, quantitative, and statistically significant data base for the aerosol distribution on a continental scale. At present, the network includes 27 stations distributed over Europe.

The network performs measurements systematically on the base of a fixed scheduling, allowing the collection of unbiased data. A rigorous quality assurance program is applied both for instruments and evaluation algorithms, and a standardised data exchange format is used.

Further observations are addressed to monitor special events such as Saharan dust outbreaks, forest fires, photochemical smog and volcano eruptions. EARLINET provides also a valid support in satellite missions, like CALIPSO.

### **May 23, 2011**

#### **Update: 07:00 UTC - May 24, 2011**

Alomar, Norway (69 16 42 N, 16 00 31 E, 380 m a.s.l.)

Measurements: 10:35 to 15:27 UTC, 21:47 to 23:58 UTC of 23/05/2011

Local meteo conditions: Rain, low clouds until midnight 23/24; very hazy/higher clouds afterward midnight

No measurements performed because of weather conditions.

Cabauw, NL ( 51.971 N, 4.927 E, -0.7 m a.s.l.)

Measurements: 12:13 UTC - 22:13 UTC of 23/05/2011

Local meteo conditions: Fair, broken clouds at low, mid and high altitudes

No volcanic layer detected.

Payerne, Switzerland (46.8N, 6.94E, 492 m a.s.l.)

Measurements: 00:00 UTC - 15:00 UTC of 23/05/2011

Local meteo conditions: clear sky

No volcanic layer detected.

Potenza, Italy (40.60N 15.72E, 760 m a.s.l.)

Local meteo conditions: cloudy sky

No measurements performed because of weather conditions.

Lecce, Italy (18.1N 40.3E, 30m a.s.l.)

Measurements: 08:44 UTC - 16:06 UTC of 23/05/2011

Local meteo conditions: cloudy sky

No volcanic layer detected.

Evora, Portugal (38.57N, 7.91W, 290 m a.s.l.)

Measurements: 10:35 to 15:27 UTC, 21:47 to 23:58 UTC of 23/05/2011

Local meteo conditions: High pressure, convective clouds in the afternoon, thunderstorms nearby in the evening  
No volcanic layer detected.

Granada, Spain (37.16 N, 3.6 W, 680 m a.s.l.)

Measurements: From 07:19 to 14:36 UTC and from 20:01 to 22:00 UTC of 23/05/2011

Local meteo conditions: Mostly clear sky

No volcanic layer detected.

Barcelona, Spain (41.39N, 2.11E, 115 m a.s.l.)

Measurements: 19:16 to 19:45 UTC of 23/05/2011

Local meteo conditions: Clear sky. Hot temperatures.

No volcanic layer detected.

Bucharest, Romania (44.35N, 26.03E, 93m a.s.l.)

Measurements: 00:25 UTC - 02:35 UTC of 24/05/2011

Local meteo conditions: clear sky

No volcanic layer detected.

## **May 24, 2011**

**Update: 07:00 UTC - May 25, 2011**

Alomar, Norway (69 16 42 N, 16 00 31 E, 380 m a.s.l.)

Local meteo conditions: Low/middle high clouds, partly rain.

No measurements performed because of weather conditions.

Cabauw, NL ( 51.971 N, 4.927 E, -0.7 m a.s.l.)

Measurements: 11:12 UTC - 18:18 UTC of 24/05/2011

Local meteo conditions: Fair, broken cumulus clouds at low altitude, and thin (contrail) cirrus at high altitude (11km).

No volcanic layer detected.

Leipzig, Germany (51.353 N, 12.435 E, 90 m a.s.l.)

Measurements: 15:55 UTC - 16:50 UTC of 24/05/2011

Local meteo conditions: Nearly clear sky.

No volcanic layer detected.

Palaiseau, France (48.718N, 2.207E, 156 m a.s.l.)

Measurements: Continuous measurements

Local meteo conditions: Clear sky.

No volcanic layer detected.

Payerne, Switzerland (46.8N, 6.94E, 492 m a.s.l.)

Measurements: 24.05.2011 18:00 until 25.05.2011 06:00 UTC

Local meteo conditions: clear sky

No volcanic layer detected.

Ispra, Italy (45°48.881N, 8°38.165E, 209m a.s.l.)

Measurements: 11:12 UTC - 18:18 UTC of 24/05/2011

Local meteo conditions: In general, clear sky. Sometimes Ci or LLC.

No volcanic layer detected.

Quicklook at: [ftp-ccu.jrc.it/pub/adam/LIDAR\\_Grimsvotn/](ftp-ccu.jrc.it/pub/adam/LIDAR_Grimsvotn/)

Potenza, Italy (40.60N 15.72E, 760 m a.s.l.)

Local meteo conditions: Cloud at 2000 m. Rain during the day.

No measurements performed because of weather conditions.

Barcelona, Spain (41.39N, 2.11E, 115 m a.s.l.)

Measurements: 10:07 – 11:10 UTC of 24/05/2011

Local meteo conditions: Clear sky. Hot temperatures.

No volcanic layer detected.

Bucharest, Romania (44.35N, 26.03E, 93m a.s.l.)

Measurements: 10:25 UTC - 12:38 UTC of 24/05/2011

00:25 UTC – 02:40 UTC of 25/05/2011

Local meteo conditions: 15% cloud coverage, T=35.7C, P=1010hPa

No volcanic layer detected. Other layers (5-6km layer) are visible during day, due to air masses come from SW Europe, and during night (3-4km) coming from NE Europe.

Evora, Portugal (38.57N, 7.91W, 290 m a.s.l.)

Measurements: 2011-05-24 19:17 UTC to 2011-05-25 04:30 UTC

Local meteo conditions: High pressure, some small convective clouds in the afternoon, few cirrus during measurement.

No volcanic layer detected.

Granada, Spain (37.16 N, 3.6 W, 680 m a.s.l.)

Measurements: 07:45 to 16:03 UTC of 24/05/2011

Local meteo conditions: Clear sky

No volcanic layer detected.

## **May 25, 2011**

**Update: 16:30 UTC - May 25, 2011**

Cabauw, NL ( 51.971 N, 4.927 E, -0.7 m a.s.l.)

Measurements: 03:39 UTC - 07:47 UTC of 25/05/2011

Local meteo conditions: Clear weather, no clouds (very scattered cumulus after the measurements were stopped).

Layer detected between 0.5 and 2 km. Layer fairly uniform with moderate depolarization and low loading.

Leipzig, Germany (51.353 N, 12.435 E, 90 m a.s.l.)

Measurements: 00:15– 16:30 UTC, still ongoing of 25/05/2011

Local meteo conditions: Clear sky.

Significant layer at 2.5 – 3 km height since around 4:00 UTC (aerosol up to 4 km and thin layer in 5-6 km). Estimated ash concentration (from observed layer in 2.5-3km height): 30-60 $\mu\text{g}/\text{m}^3$ .

From 11:00 to 15:10 UTC strongly depolarizing layer at 2.5 km altitude (aerosol up to 6 km).

Linköping, Sweden (58.39N, 15.57E 80 m a.s.l.)

Measurements: 09:13 – 13:51 UTC of 25/05/2011

17:00 – 21:00 UTC of 25/05/2011

Local meteo conditions: Covering clouds (09:13 – 13:51 UTC) and clear sky (17:00 – 21:00 UTC)

No volcanic layer detected. VAAC and A'lula simulation indicated ash in the area.

Payerne, Switzerland (46.8N, 6.94E, 492 m a.s.l.)

Measurements: Continuously from 24/05/2011 18:00 UTC to 25/05/2011 15:30 UTC

Local meteo conditions: clear sky

No volcanic layer detected.

Potenza, Italy (40.60 N 15.72 E, 760 m a.s.l.)

Local meteo conditions: Clouds at 1000 m and rain during the afternoon.

No measurements performed because of weather conditions.

Bucharest, Romania (44.35N, 26.03E, 93m a.s.l.)

Measurements: 10:20 UTC - 12:37 UTC of 25/05/2011

Local meteo conditions: about 15% cloud coverage, T=31.1C, P=1008hPa, RH=41%

Layer at about 3 km observed. HYSPLIT backtrajectory analysis indicates it comes from Russia.

## **May 26, 2011**

### **Update: 08:00 UTC - May 25 and 26, 2011**

Palaiseau, France (48.718N, 2.207E, 156 m a.s.l.)

Measurements: Continuous measurements. Update 06:45 UTC (26/05/2011)

Local meteo conditions: some cirrus clouds located around 10 km (25/05/2011), cirrus cloud between 7 and 9 km (26/05/2011)

On 25 and 26/05/2011: Depolarizing layer between 1.5 and 7 km. Extinction less than 0.01 km<sup>-1</sup> (or about 20 $\mu\text{g}/\text{m}^3$ ). Total AOD at 355nm = 0.1. Aeronet retrievals indicate about 50% fine and 50% coarse with coarse mode between 1-5  $\mu\text{m}$ . Under analysis.

Maisach, Germany (48.209N, 11.258E, 519 m a.s.l.)

Measurements: 15:16 - 23:55 UTC of 25/05/2011

Local meteo conditions: Sometimes Ci clouds, LLC or clouds in top of PBL. High T.

Thin elevated layers, particle linear depolarization ~ 8 %, probably no volcanic ash.

Barcelona, Spain (41.39N, 2.11E, 115 m a.s.l.)

Measurements: 09:01 – 10:00 UTC , 18:12 – 19:11 UTC of 25/05/2011

Local meteo conditions: Clear sky. Hot temperatures.

Layers observed between ground and 4 km. Further analysis is necessary to check if the layers observed are formed by ash.

Bucharest, Romania (44.35N, 26.03E, 93m a.s.l.)

Measurements: 00:15 UTC - 02:15 UTC of 26/05/2011

Local meteo conditions: Mostly cloudy, T=22C, P=1008hPa, RH=62%

Alto Clouds, Layer observed at 2000m, No volcanic ash layer, air mass trajectories coming from NE Europe (Russia).

Evora, Portugal (38.57N, 7.91W, 290 m a.s.l.)

Measurements: 2011-05-25 20:50 UTC to 2011-05-26 06:45 UTC (still ongoing)

Local meteo conditions: Cirrus, and mid-altitude clouds (around 4 km) on top of Saharan dust layer  
Layers observed not of volcanic origin.

Potenza, Italy (40.60N 15.72E, 760 m a.s.l.)

Measurements: 20:42 – 23:15 UTC (25/05/2011)

Local meteo conditions: Clear sky. Mostly cloudy during evening.

Layers at 2 km. Aerosol up to 4.5 km A.S.L., Saharan dust forecasted with layers between 2 and 5 km. (DREAM model).

Payerne, Switzerland (46.8N, 6.94E, 492 m a.s.l.)

Measurements: Continuously from 24/05/2011 18:00 UTC to 25/05/2011 09:00 UTC

Local meteo conditions: clear sky

No volcanic layer detected.

Ispra, Italy (45°48.881N, 8°38.165E, 209m a.s.l.)

Measurements: 00:00 UTC (25/05/2011 – 06:15 UTC (26/05/2011), Stopped between 08:44 and 12:17 UTC due to light rain

Local meteo conditions: Sometimes Ci clouds, LLC or clouds in top of PBL. High T.

No volcanic layer detected.

Quicklook at: [ftp-ccu.jrc.it/pub/adam/LIDAR\\_Grimsvotn/](ftp-ccu.jrc.it/pub/adam/LIDAR_Grimsvotn/)

Alomar, Norway (69 16 42 N, 16 00 31 E, 380 m a.s.l.)

Local meteo conditions: Rain, fog .

No useful measurements performed because of weather conditions.

Granada, Spain (37.16 N, 3.6 W, 680 m a.s.l.)

Measurements: 08:12-16:47 UTC of 25/05/2011

Local meteo conditions: Clear sky

No volcanic layer detected.

### **Update: 17:30 UTC - May 26, 2011**

Bucharest, Romania (44.35N, 26.03E, 93m a.s.l.)

Measurements: 0:21 UTC - 12:34 UTC of 26/05/2011

Local meteo conditions: ~ 60% cloud coverage, T=29.3C, P=1011hPa, RH=36%

Alto Clouds, Layer observed at 2000-3000m, air mass trajectories coming from NE Europe (Russia).

Sofia, Bulgaria (42.67N, 23.33E, 550 m a.s.l.)

Measurements: 09:10 - 11:05 UTC of 26/05/2011

Local meteo conditions: Low clouds before rain

No volcanic layer detected.

Palaiseau, France (48.718N, 2.207E, 156 m a.s.l.)

Measurements: LNA 532/1064 nm Lidar: until 16UTC on 26/05/2011

ALS450 355 nm Lidar: Continuous

Local meteo conditions: Boundary layer clouds since 5UTC + cirrus clouds (26/05/2011); Boundary layer clouds (27/05/2011)

Yes before 5UTC on 26/05/2011 and at 8 UTC (BL clouds became broken so aerosols layers could be observed again)

- Layers observed at 2-7 km (05:00 UTC 26/05/2011): Aeronet analysis: 355nm-AOD=0.35 (coarse mode : 35%)
- Layers observed at 2-4 km (08:00 UTC 26/05/2011): 2-4 km. Aeronet analysis: 355nm-AOD=0.15 (coarse mode : 35%)

## **May 27, 2011**

### **Update: 08:00 UTC - May 27, 2011**

Bucharest, Romania (44.35N, 26.03E, 93m a.s.l.)

Measurements: 00:15 UTC - 02:35 UTC of 26/05/2011

Local meteo conditions: 20% thin layers of low clouds, T=21C, P=1010hPa, RH=68%

Layers observed at 2500m, 7800m and 8900m coming from W-NW Europe according to HYSPLIT backtrajectory analysis.

Potenza, Italy (40.60N 15.72E, 760 m a.s.l.)

Measurements: 19:22 – 21:43 UTC (26/05/2011)

Local meteo conditions: Clear sky.

Aerosol from ground level until 4 km. Layer at 5 km A.S.L. Saharan dust forecasted with thin layer at 4 km. (DREAM model).

Payerne, Switzerland (46.8N, 6.94E, 492 m a.s.l.)

Measurements: Continuously from 24/05/2011 18:00 UTC to 26/05/2011 00:59 UTC

Local meteo conditions: Stratus with base down to 2000 m asl, some rain

No volcanic layer detected. Measurements limited because of clouds and rain

Evora, Portugal (38.57N, 7.91W, 290 m a.s.l.)

Measurements: 20:50 UTC (2011/05/25) to 07:05 UTC (26/05/2011)

19:28 - 22:35 UTC (26/05/2011)

Local meteo conditions: Showers in the afternoon, few low clouds during the measurement

Layers observed not of volcanic origin.

Barcelona, Spain (41.39N, 2.11E, 115 m a.s.l.)  
Measurements: 0931 - 1030 UTC (26/05/2011)  
18:11 - 1840 UTC (26/05/2011)  
18:43 - 1912 UTC (26/05/2011)

Local meteo conditions: Clear sky. Hot temperatures.  
No volcanic layer detected.

Granada, Spain (37.16 N, 3.6 W, 680 m a.s.l.)  
Measurements: 12:18-13:48 UTC of 26/05/2011  
Local meteo conditions: Low/middle high clouds, partly rain  
No volcanic layer detected.

Ispra, Italy (45°48.881N, 8°38.165E, 209m a.s.l.)  
Measurements: 00:00 UTC (26/05/2011) – 06:02 UTC (27/05/2011). Stopped between 07:21 and 09:52 UTC (26/05/2011) due to light rain  
Local meteo conditions: Ci clouds, LLC, CTBL (cloud topped boundary layer), and rain.  
No volcanic layer detected.  
Quicklook at: [ftp-ccu.jrc.it/pub/adam/LIDAR\\_Grimsvotn/](ftp-ccu.jrc.it/pub/adam/LIDAR_Grimsvotn/)

Lecce, Italy (18.1N 40.3E, 30 m a.s.l.)  
Measurements: 04:40-11:47 UTC of 26/05/2011  
Local meteo conditions: Cloudy sky  
No volcanic layer detected.

Alomar, Norway (69 16 42 N, 16 00 31 E, 380 m a.s.l.)  
Local meteo conditions: Rain, fog and low clouds.  
No useful measurements performed because of weather conditions.

#### **Update: 16:00 UTC - May 27, 2011**

Bucharest, Romania (44.35N, 26.03E, 93m a.s.l.)  
Measurements: 03:30 UTC - 15:30 UTC of 27/05/2011  
Local meteo conditions: Clear Sky, T=25C, P=1010hPa  
Layers observed at 2000 and 3000 m. Air masses come from W-NW Europe according to HYSPLIT backtrajectory analysis.

Sofia, Bulgaria (42.67N, 23.33E, 550 m a.s.l.)  
Measurements: 09:58 - 12:00 UTC of 27/05/2011  
Local meteo conditions: Clear sky  
No volcanic layer detected.

Payerne, Switzerland (46.8N, 6.94E, 492 m a.s.l.)  
Measurements: Continuously up to 15:00 UTC 26/05/2011  
Local meteo conditions: Stratus Broken stratus with base at 2500m  
No volcanic layer detected.

## **May 28, 2011**

### **Update: 08:00 UTC - May 28, 2011**

Bucharest, Romania (44.35N, 26.03E, 93m a.s.l.)

Measurements: 20:30 UTC - 22:30 UTC of 27/05/2011

00:30 UTC - 04:30 UTC of 28/05/2011

Local meteo conditions: Clear Sky, T=21C, P=1006hPa

Layers observed at 2000m, 3000m and 4000m coming from W-NW Europe according to HYSPLIT backtrajectory analysis.

Ispra, Italy (45°48.881N, 8°38.165E, 209m a.s.l.)

Measurements: 00:00 UTC (27/05/2011) – 06:01 UTC (28/05/2011). Stopped between 09:42 and 11:24 UTC (27/05/2011) due to light rain.

Local meteo conditions: LLC, CTBL (cloud topped boundary layer), and rain. Now, clear sky.

No volcanic layer detected.

Quicklook at: [ftp-ccu.jrc.it/pub/adam/LIDAR\\_Grimsvotn/](ftp-ccu.jrc.it/pub/adam/LIDAR_Grimsvotn/)

Alomar, Norway (69 16 42 N, 16 00 31 E, 380 m a.s.l.)

Measurements: 10:51-12:56 UTC and 13:20-19:54 UTC (27/05/2011).

Operation period 08:00-01:00 LT; no operation 01:00 – 08:00 LT.

Local meteo conditions: RH 70%; some cirrus

Several fine aerosol layers, most prominent at around 4.0-4.5 km.

Payerne, Switzerland (46.8N, 6.94E, 492 m a.s.l.)

Measurements: Continuously up to 07:00 UTC 28/05/2011

Local meteo conditions: Some leftovers of a stratus, mostly clear sky

Layers between 4000 and 5000 m since 22: UTC of 27/05/2011, very weak amplitude, needs investigation.