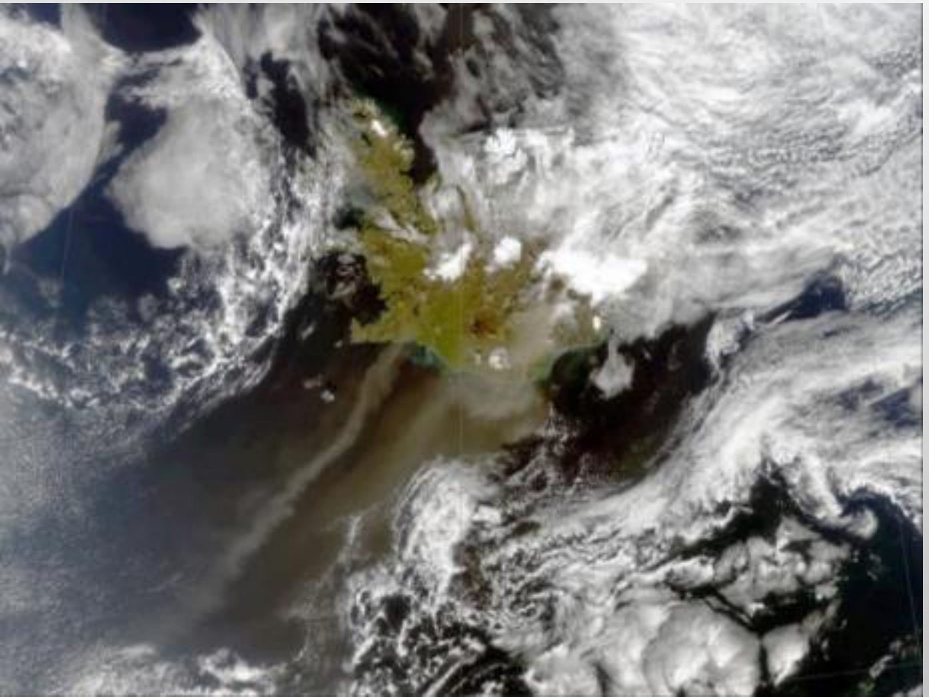
ICELAND – THE LARGEST AND MOST ACTIVE DESERT IN THE ARCTIC AND EUROPE



PAVLA DAGSSON WALDHAUSEROVA

O. ARNALDS, H. OLAFSSON, O. MEINANDER, M. GRITSEVICH, J. PELTONIEMI, J-B RENARD, J. HLADIL, L. CHADIMOVA, AND MORE

THE WEBINAR AT THE WMO SDS-WAS REGIONAL CENTER FOR NORTHERN AFRICA, MIDDLE EAST AND EUROPE

BARCELONA, SPAIN

OBJECTIVES

- HIGH LATITUDE DUST SOURCES (HLD)
- **ICELAND** AS MAIN CONTRIBUTOR OF HLD AREAS
- LONG-TERM FREQUENCY AND CLIMATOLOGY OF DUST STORMS
- PHYSICAL PROPERTIES OF VOLCANIC DUST BASED ON THREE UNUSUAL DUST EVENTS FROM ICELAND
- OPTICAL PROPERTIES OF VOLCANIC DUST PARTICLES COMPARED TO BLACK CARBON
- ICELANDIC AEROSOL AND DUST ASSOCIATION (ICEDUST)

HIGH LATITUDE DUST AREAS

AGU PUBLICATIONS

Reviews of Geophysics

REVIEW ARTICLE

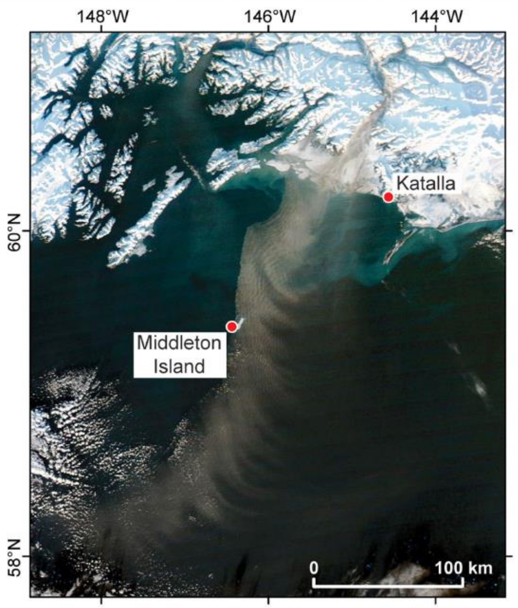
10.1002/2016RG000518

High-latitude dust in the Earth system

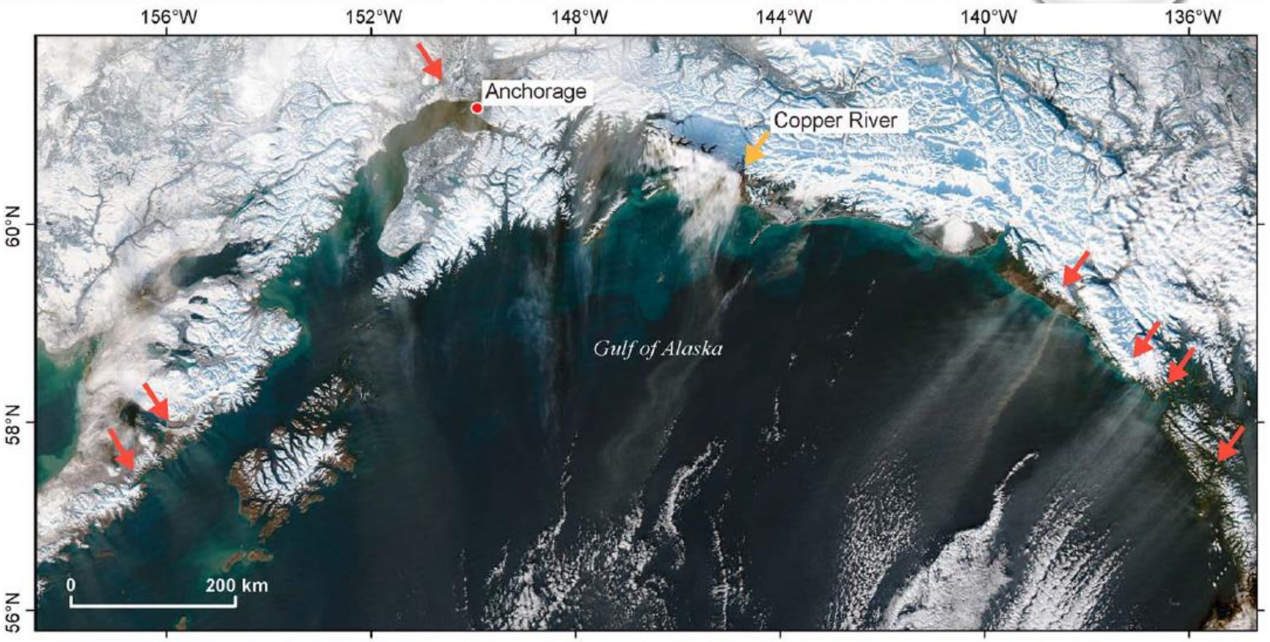
Joanna E. Bullard[1], Matthew Baddock[1], Tom Bradwell[2], John Crusius[3], Eleanor Darlington[1], Diego Gaiero[4], Santiago Gassó[5], Gudrun Gisladottir[6], Richard Hodgkins[1], Robert McCulloch[2], Cheryl McKenna-Neuman[7], Tom Mockford[1], Helena Stewart[2], and Throstur Thorsteinsson[8]

Key Points:
- High-latitude dust sources are located in paraglacial regions ≥50°N and ≥40°S

- THE MAIN SOURCES OF DUST EMISSIONS IN THE NORTHERN (ALASKA, CANADA, GREENLAND, AND ICELAND) AND SOUTHERN (ANTARCTICA, NEW ZEALAND, AND PATAGONIA) HEMISPHERES
- HIGH-LATITUDE SOURCES COVER >500,000 KM^2
- CONTRIBUTION OF 80 – 100 TG YR^{-1} OF DUST TO THE EARTH SYSTEM (~5% OF THE GLOBAL DUST BUDGET)



MODIS Aqua image 4 December 2012 showing a major dust plume originating from the Copper River valley a



MODIS Terra image 26 February 2011 showing multiple dust plumes being transported over the Gulf of Alaska.

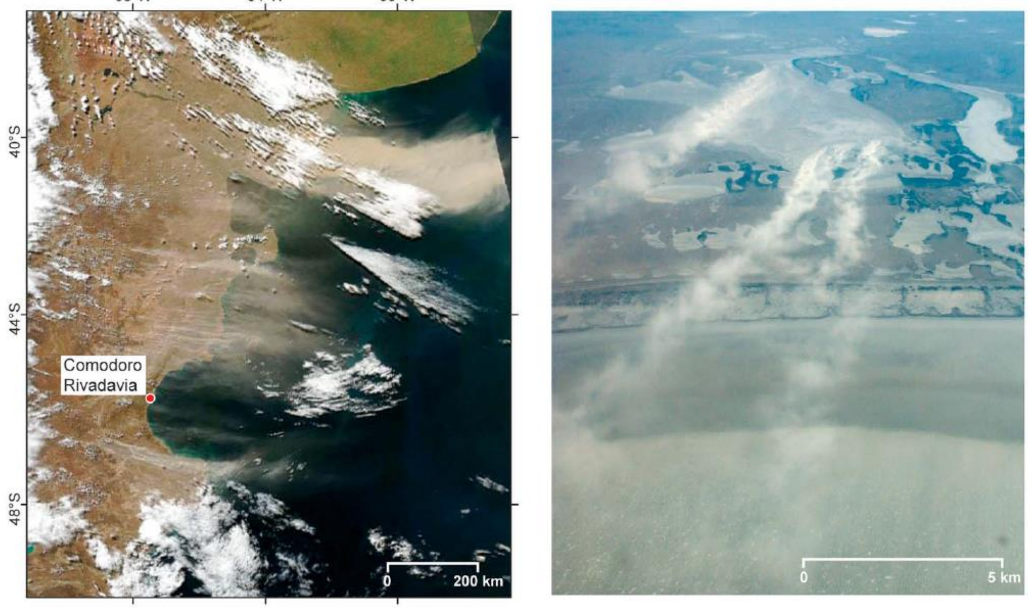


Figure 18. (left) MODIS Aqua image 28 March 2009 showing multiple dust plumes in Patagonia caused by strong westerly winds extending over the south Atlantic. The most dense plume originates from the Colorado and Negro River mouths in the north which were particularly active in 2009 due to combined drought and poor rangeland management. (right) Aerial photograph of dust storm in October 2004 caused by winds gusting to 29 m s^{-1} at San Sebastián Bay, Tierra del Fuego, 800 km south of Comodoro Rivadavia.

Figure 9. Dust event at Kangerlussuaq, SW Greenland, 1 July 2014. Phot

ICELAND AND SOURCES OF AIR POLLUTION

- TOTAL ICELANDIC DESERT AREAS COVER OVER 44,000 KM^2
- ICELAND IS THE LARGEST ARCTIC AS WELL AS EUROPEAN DESERT
- > 40 % OF ICELAND IS CLASSIFIED WITH CONSIDERABLE TO VERY SEVERE EROSION

WHAT MAKES ICELANDIC DUST SOURCES SO ACTIVE?

- FREQUENT VOLCANIC ERUPTIONS (+GLACIAL OUTBURST FLOODS “JÖKULHLAUP”)
- FREQUENT STRONG WINDS

Aeolian Research 20 (2016) 176–195

Contents lists available at ScienceDirect

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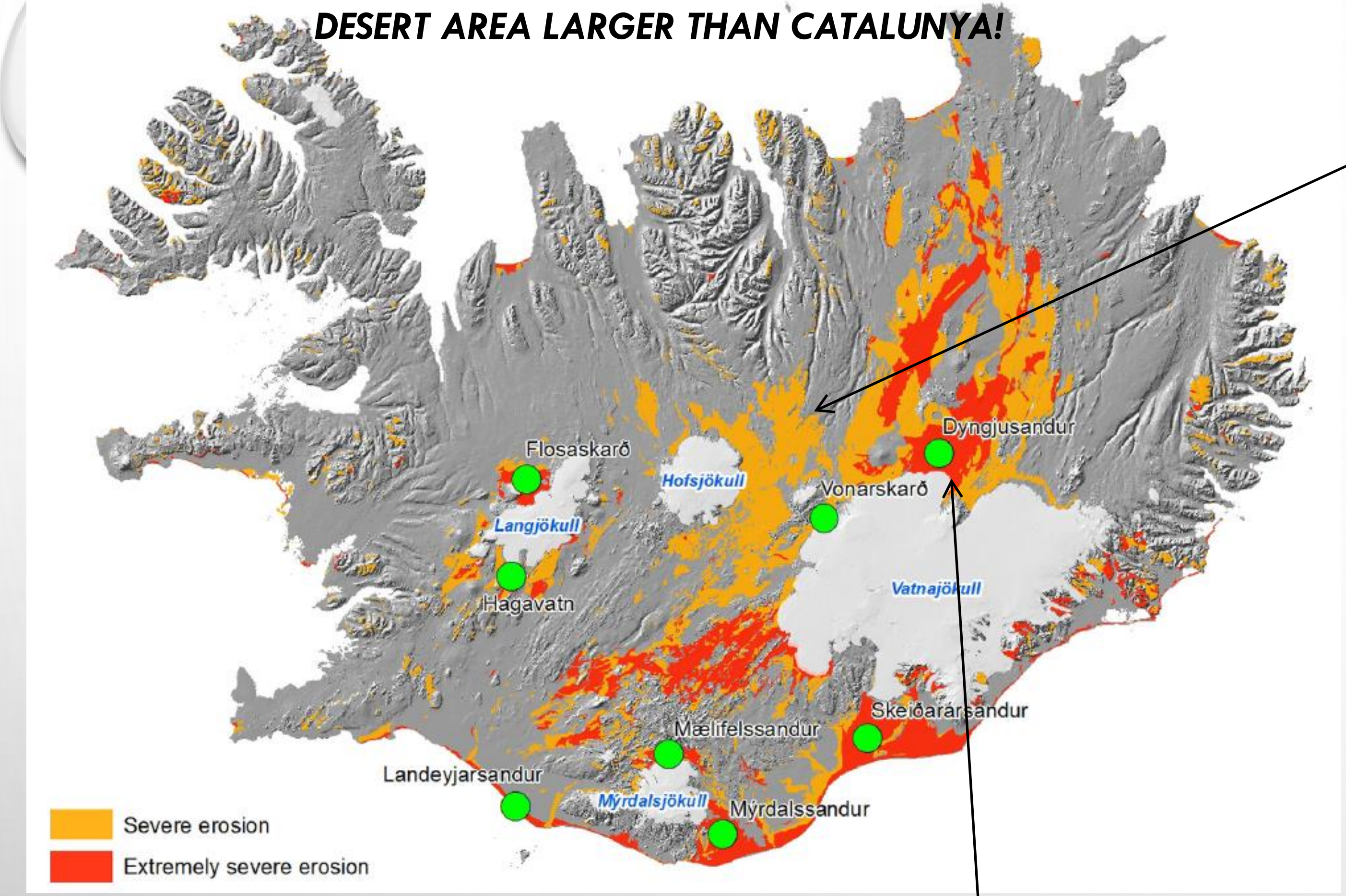
journal homepage: www.elsevier.com/locate/aeolia

ELSEVIER

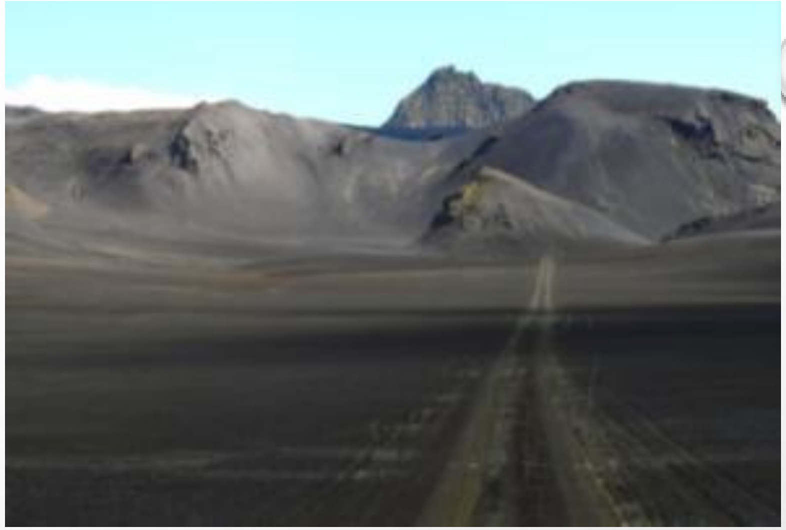
Review article

The Icelandic volcanic aeolian environment: Processes and impacts — A review

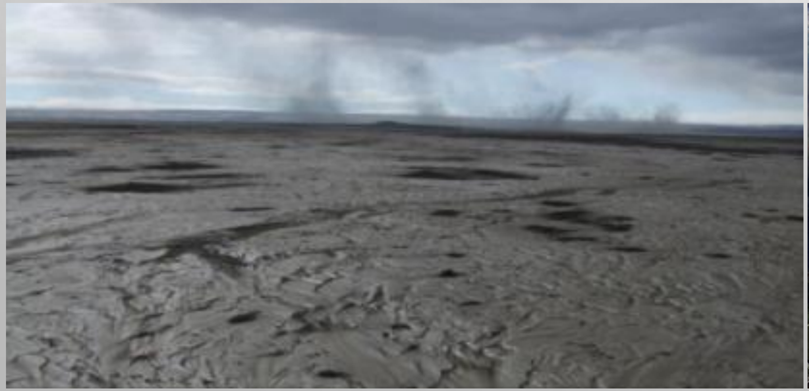
Olafur Arnalds[a,b,*], Pavla Dagsson-Waldhauserova[a,c,d], Haraldur Olafsson[d,e]

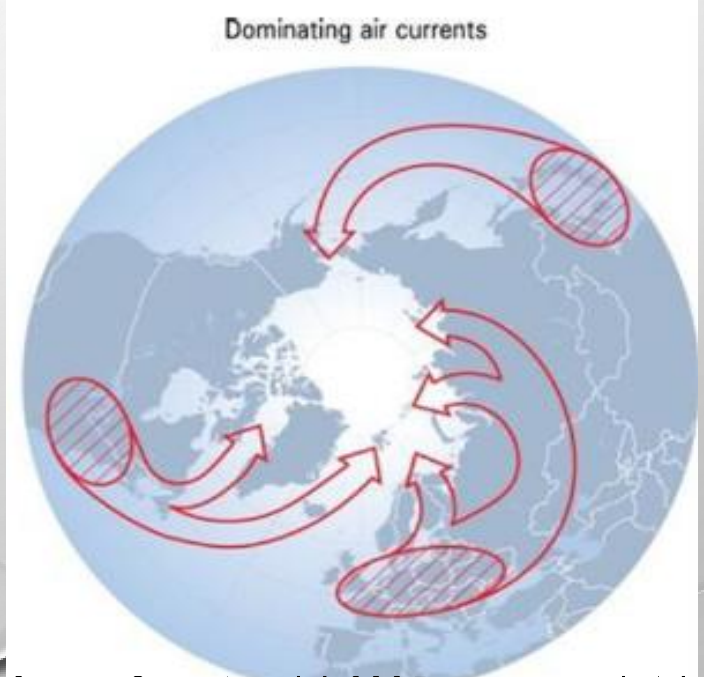


volcanic sandy deserts (22% of Iceland)



glacial riverbeds and ice-proximal areas = “dust hot spots”





Source: GRID-Arendal, 2005. Barentswatch Atlas.

Atmos. Chem. Phys., 14, 13411–13422, 2014
www.atmos-chem-phys.net/14/13411/2014/
doi:10.5194/acp-14-13411-2014

Atmospheric Chemistry and Physics
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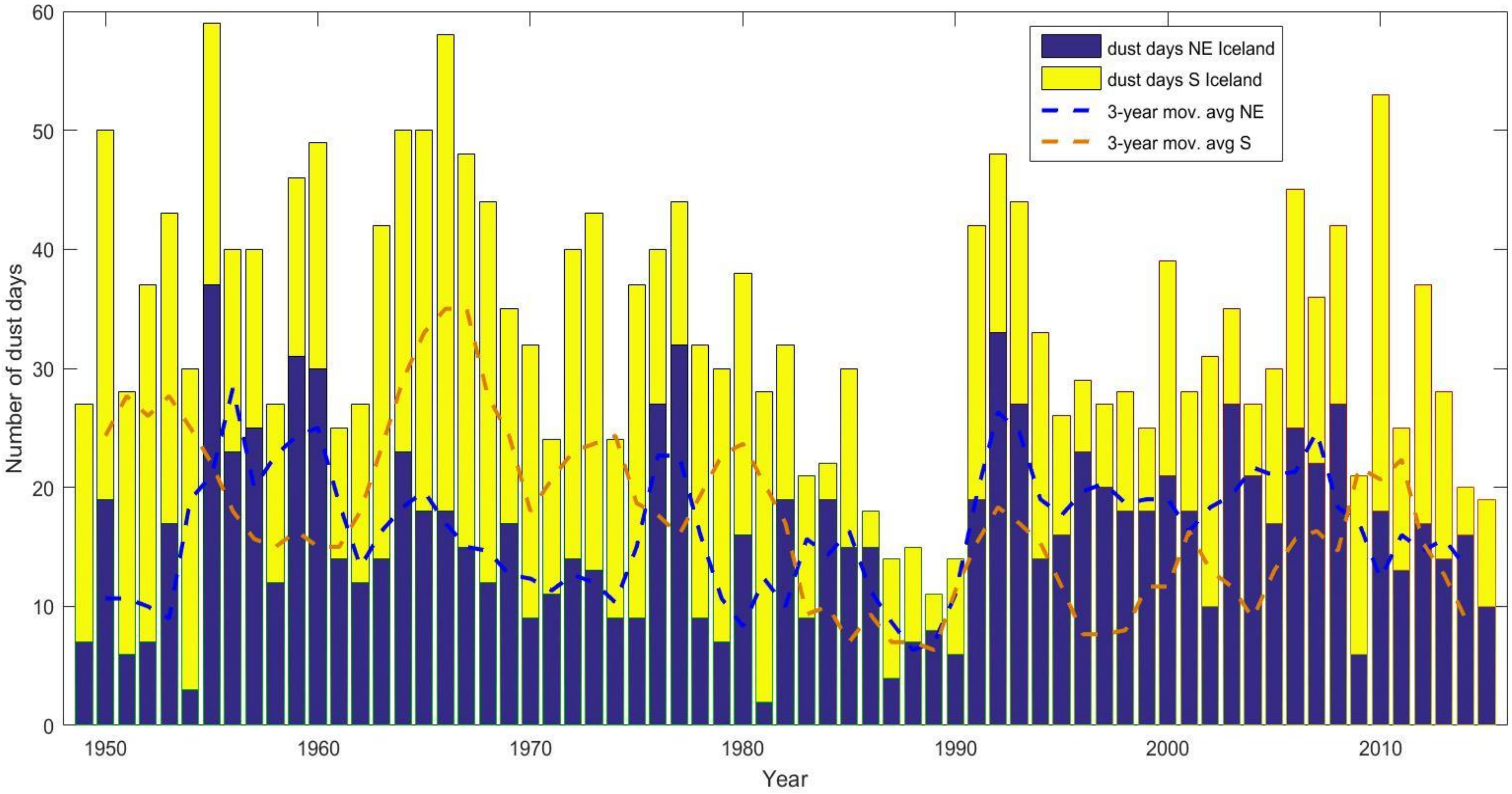
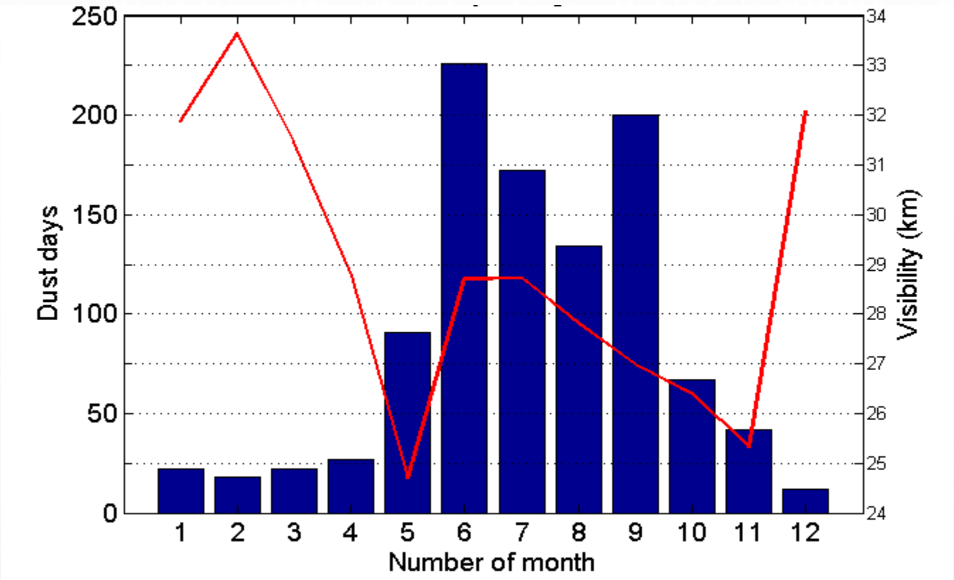


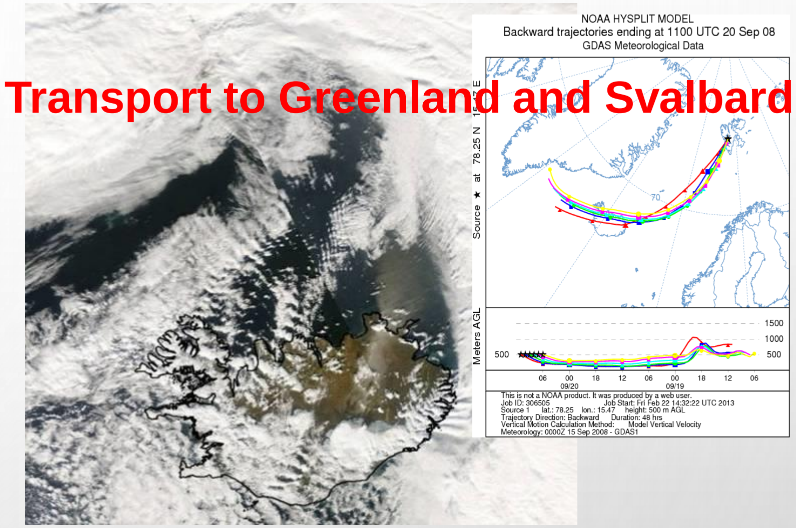
SEASONAL VARIABILITY OF DUST EVENTS

- NE ICELAND

"ARCTIC DUST EVENTS"

SUMMER

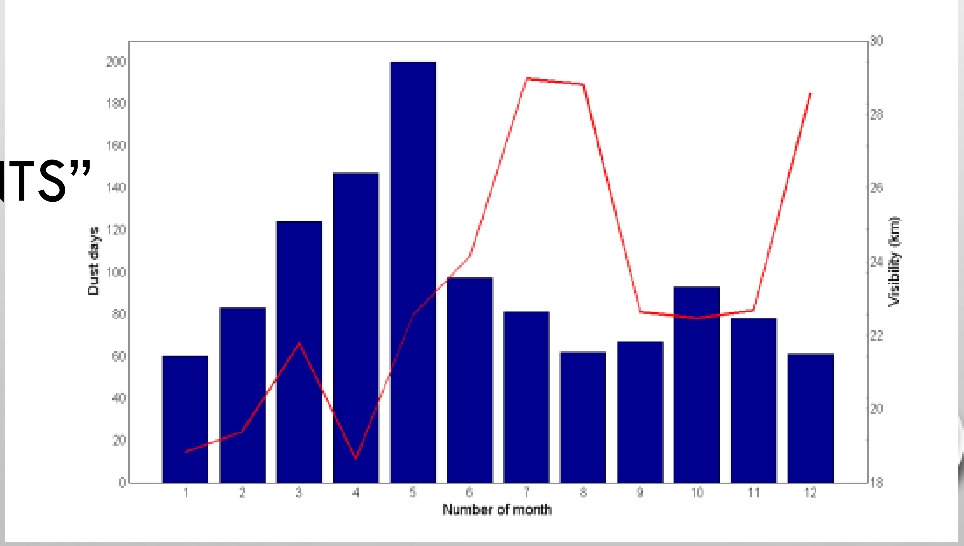


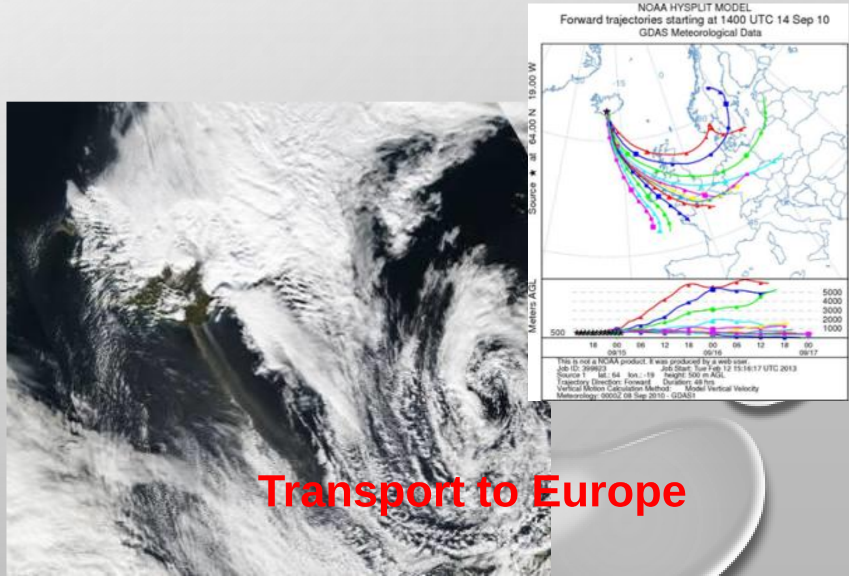


- S ICELAND

"SUB-ARCTIC DUST EVENTS"

WINTER-SPRING





Biogeosciences, 11, 6623–6632, 2014
www.biogeosciences.net/11/6623/2014/
doi:10.5194/bg-11-6623-2014

Biogeosciences
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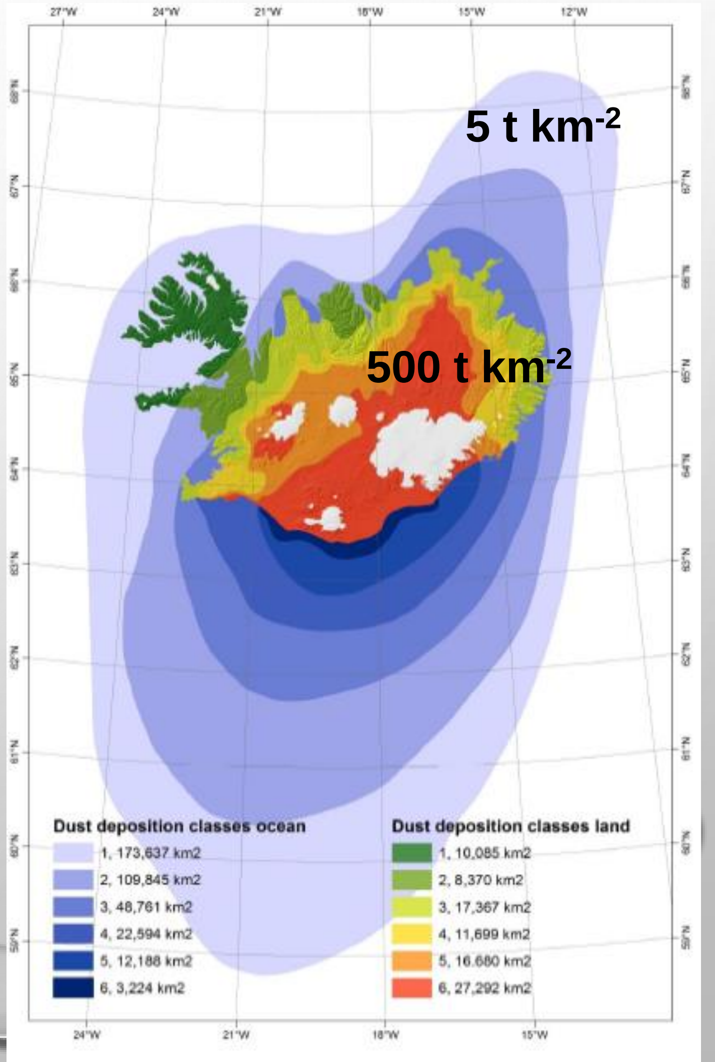
Quantification of iron-rich volcanogenic dust emissions and deposition over the ocean from Icelandic dust sources

O. Arnalds[1], H. Olafsson[2,3,4], and P. Dagsson-Waldhauserova[1,2]

DISTRIBUTION OF DUST DEPOSITION

- TOTAL EMISSIONS RANGE FROM <u>**30.5** TO **40.1** MILLION T</u>
- TWO APPROACHES: 1. DUST EVENT BASED CALCULATION
  2. DEPOSITION RATES (ARNALDS, 2010)
- LAND DEPOSITION: 25-26 MILLION TONS
- OCEAN DEPOSITION: 5.5 TO 13.8 MILLION TONS
- CALCULATED IRON DEPOSITION: 0.56 TO 1.4 MILLION T
- ICELANDIC GLACIERS: 4.5 MILLION TONS ANNUALLY



AVERAGE DISTRIBUTION OF DUST DEPOSITION

- THE DUST DEPOSITION PER UNIT AREA: 10.4–25.7 T KM^{-2} YR^{-1} ON AVERAGE OVER 370,000 KM^2 SEA AREA

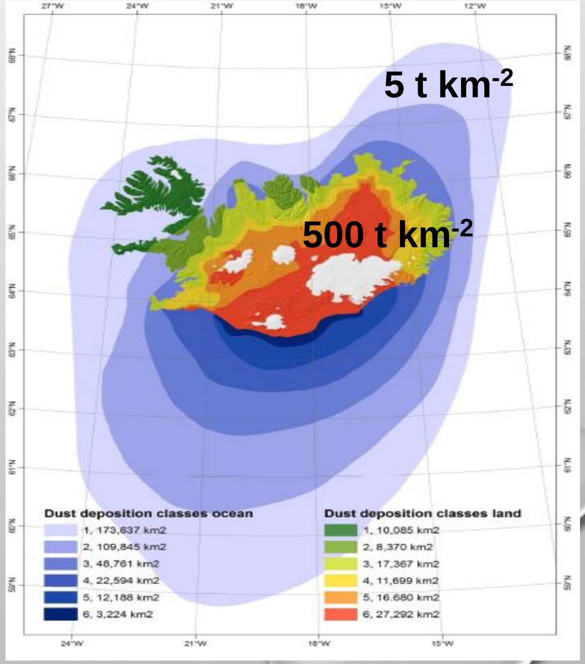
> SEA OF WEST OF THE SAHARA IS CONSIDERED ABOUT 10 T KM^{-2} YR^{-1} (DUCE ET AL., 1991)

- CALCULATED IRON DEPOSITION: 0.56-1.4 MILLION TONS OVER SEA AREAS

> ATMOSPHERIC SOURCES OF IRON: 16 MILLION T FE YR^{-1} (JICKELLS ET AL., 2005)

- BIOAVAILABLE IRON BASED ON 0.02% BIOAVAILABILITY (ACHTERBERG ET AL., 2013)

> BIOAVAILABLE FE IS 0.04-10 MG M^{-2} YR^{-1}



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doi:10.5194/bg-11-6623-2014

Quantification of iron-rich volcanogenic dust emissions and deposition over the ocean from Icelandic dust sources

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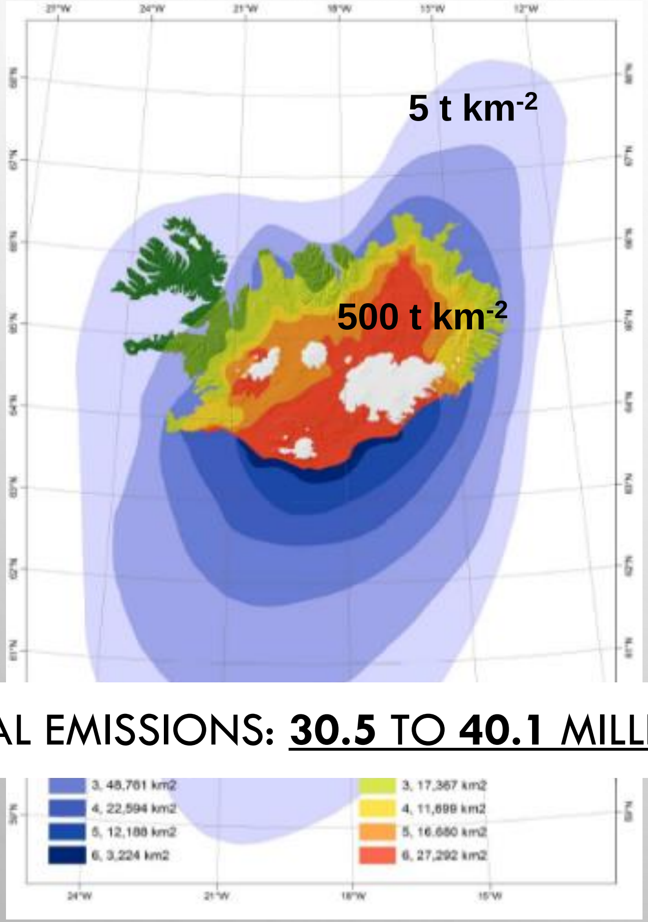
DISTRIBUTION OF DUST DEPOSITION

Atmos. Chem. Phys., 17, 10865–10878, 2017
https://doi.org/10.5194/acp-17-10865-2017

Atmospheric Chemistry and Physics

Temporal and spatial variability of Icelandic dust emissions and atmospheric transport

Christine D. Groot Zwaaftink[1], Ólafur Arnalds[2], Pavla Dagsson-Waldhauserova[2,3,4], Sabine Eckhardt[1], Joseph M. Prospero[5], and Andreas Stohl[1]



- TOTAL EMISSIONS: <u>**30.5** TO **40.1** MILLION T</u>

- TOTAL EMISSIONS: **4.3 ± 0.8** TG

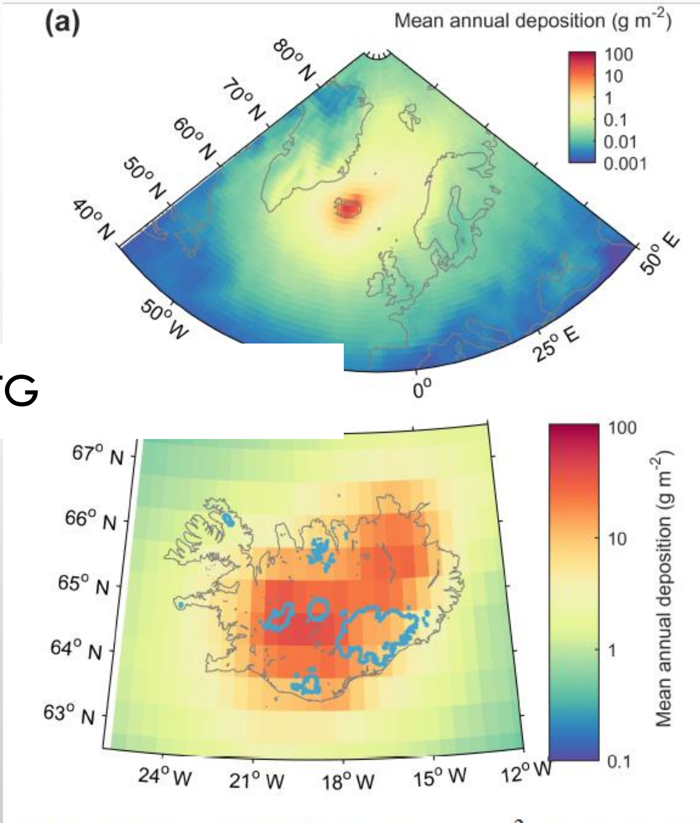


Figure 10. Mean annual dust deposition ($g\,m^{-2}$) simulated with FLEXPART in years 1990–2016 for the North Atlantic region **(a)** and Iceland **(b)**. Maximum values are lower in the upper panel than in the lower panel as this figure shows averages over larger areas. The blue lines in the bottom figure are glacier outlines.

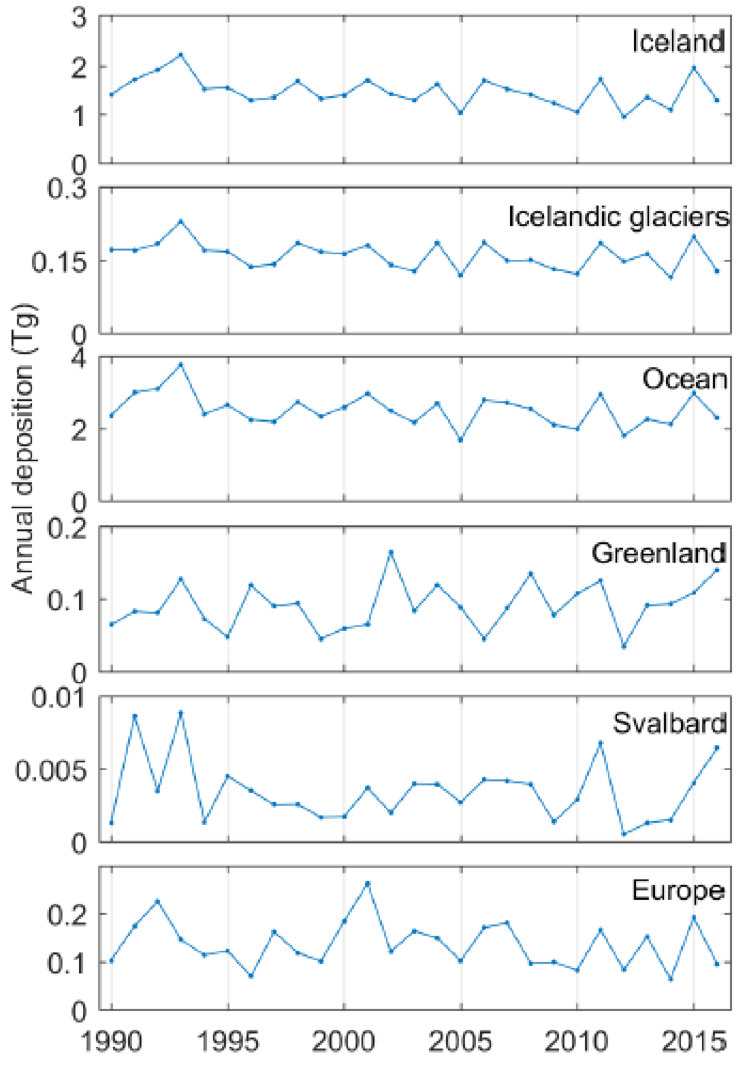


Figure 12. Time series (1990–2016) of modelled dust deposition ($Tg\,yr^{-1}$) in specific regions. Note that Iceland also includes deposition on Icelandic glaciers.

- Ocean deposition was on average 2.5 Tg or 58% of annually emitted dust
- Smaller fractions of emitted dust ended up in Greenland (2 %) and Svalbard (< 0,1 %)
- About 7% of emitted dust is deposited in the high Arctic (> 80° N)
- Europe deposition (3% of emitted dust)

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Earth and Planetary Science Letters

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Pathways of high-latitude dust in the North Atlantic

Matthew C. Baddock [a,*], Tom Mockford [a], Joanna E. Bullard [a], Throstur Thorsteinsson [b]

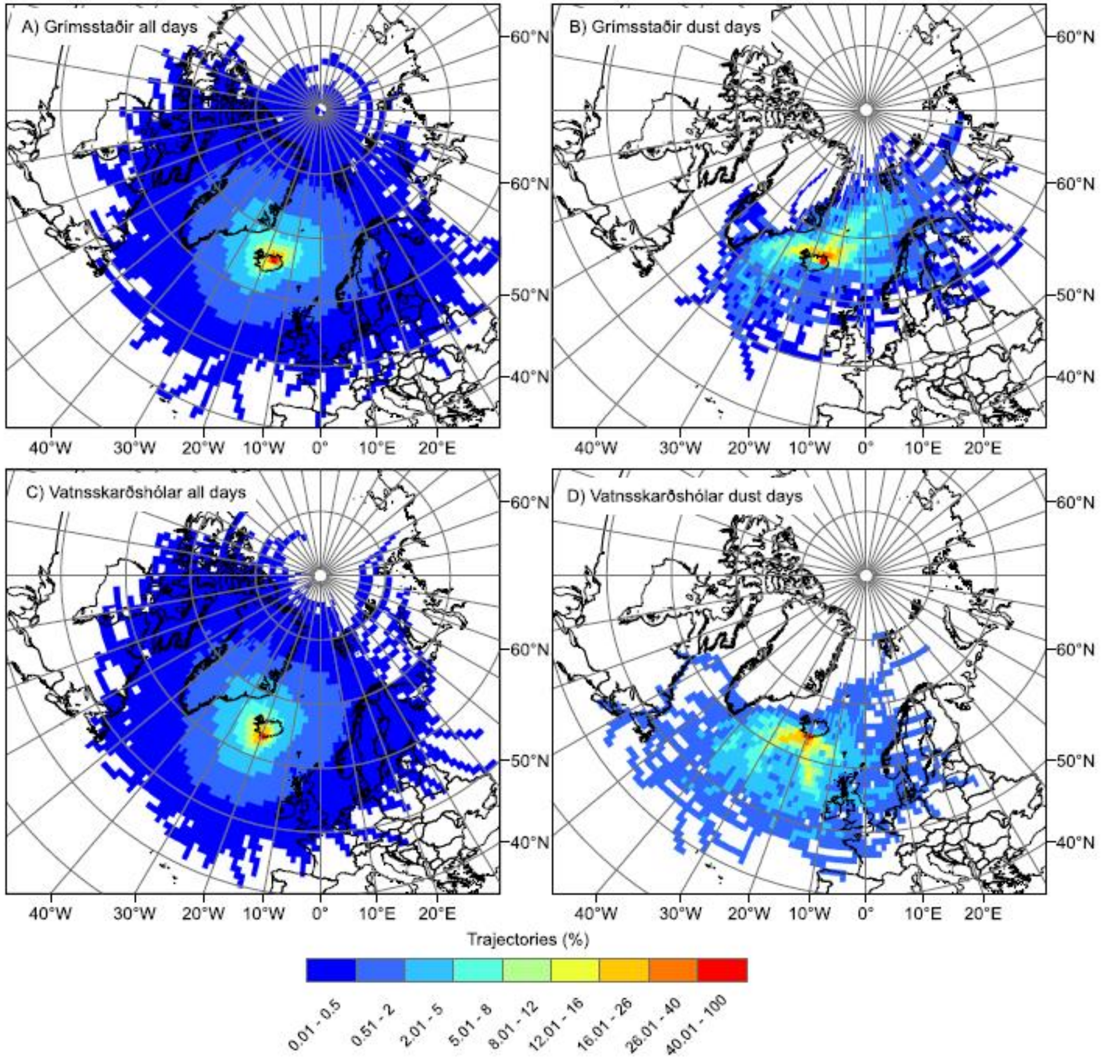
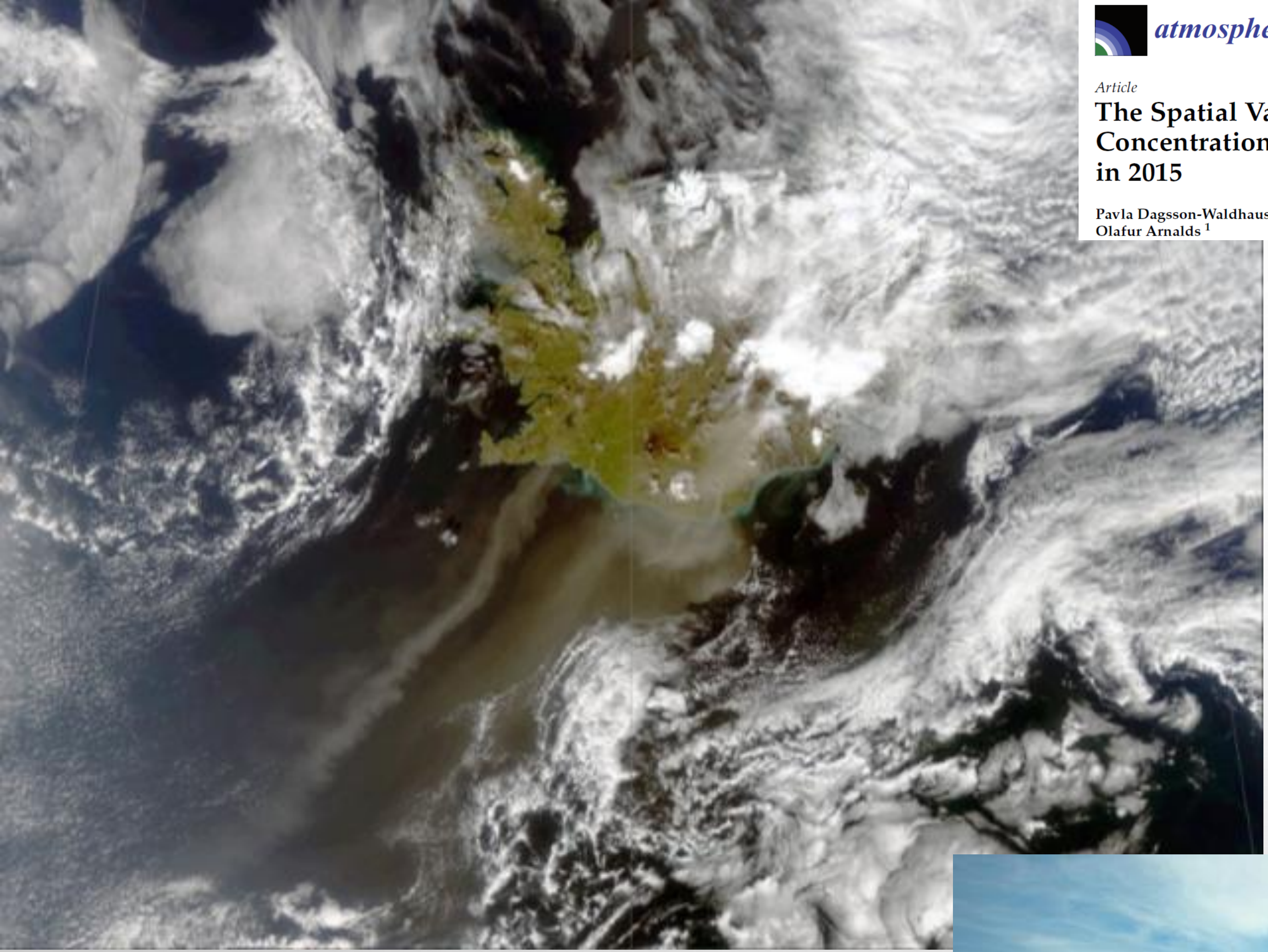


Fig. 2. Trajectory line density (% of trajectories per 1° × 1° cell) for 72 h simulations run at a 100 m start height from Grímsstaðir for all days 1992–2012 (A), and dust observation days only (B), from Vatnsskarðshólar for all days 1992–2012 (C), and dust observation days only (D). See Fig. 1 for trajectory start points.



atmosphere

MDPI

Article

The Spatial Variation of Dust Particulate Matter Concentrations during Two Icelandic Dust Storms in 2015

Pavla Dagsson-Waldhauserova [1,2,3,*], Agnes Ösp Magnusdottir [1], Haraldur Olafsson [2,4] and Olafur Arnalds [1]

DUST FRONT ABOVE HVERAGERÐI, JUNE 15, 2015

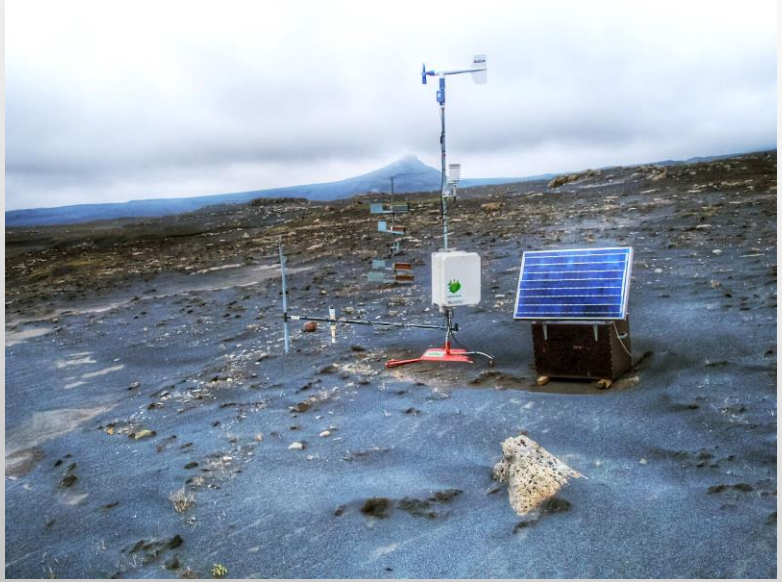
REYKJAVÍK HAZE, SEPTEMBER 11, 2011

HVALFJÖRÐUR DUST, MARCH 24, 2012

CAMERA MONITORING SYSTEM – 3 MOST ACTIVE DESERTS

PHYSICAL PROPERTIES OF VOLCANIC DUST BASED ON THREE UNUSUAL DUST EVENTS FROM ICELAND

1. Extreme wind erosion event of Eyjafjallajökull volcanic ash



September 14-15th, 2010

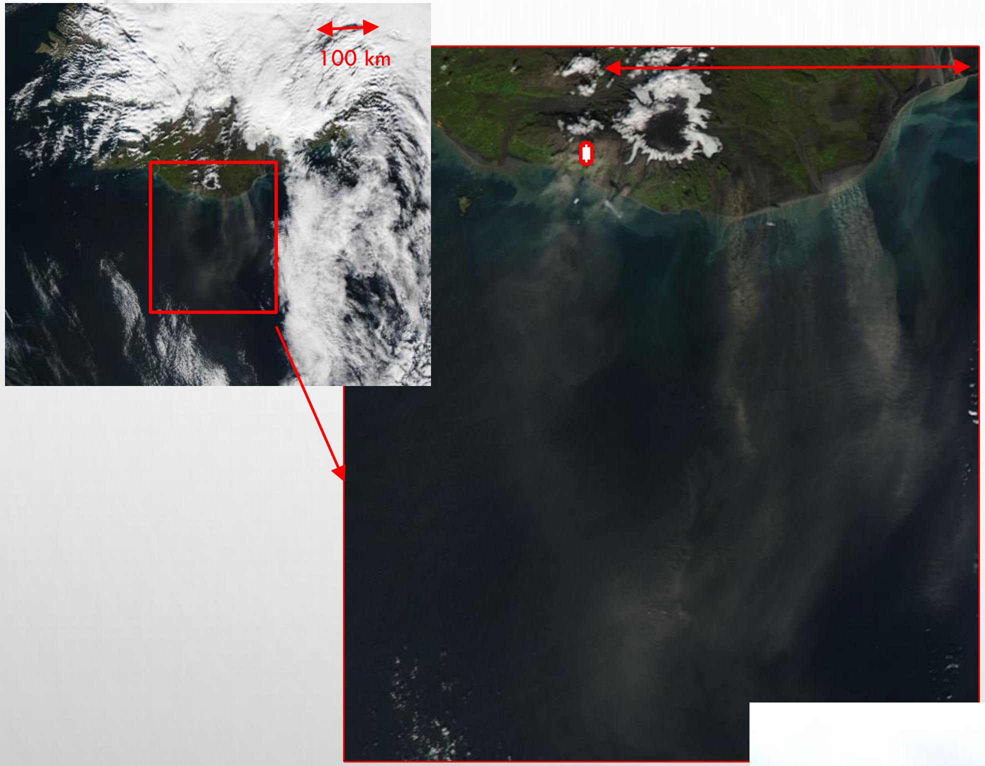
2. Snow-Dust Storm

March 6-7th, 2013

3. Suspended dust during moist and low wind conditions

August 12th, 2013

1. AN EXTREME WIND EROSION EVENT OF EYJAFJALLAJÖKULL VOLCANIC ASH IN 2010

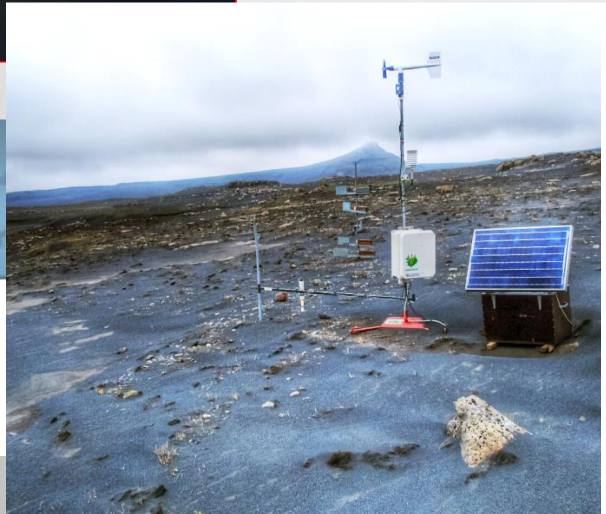


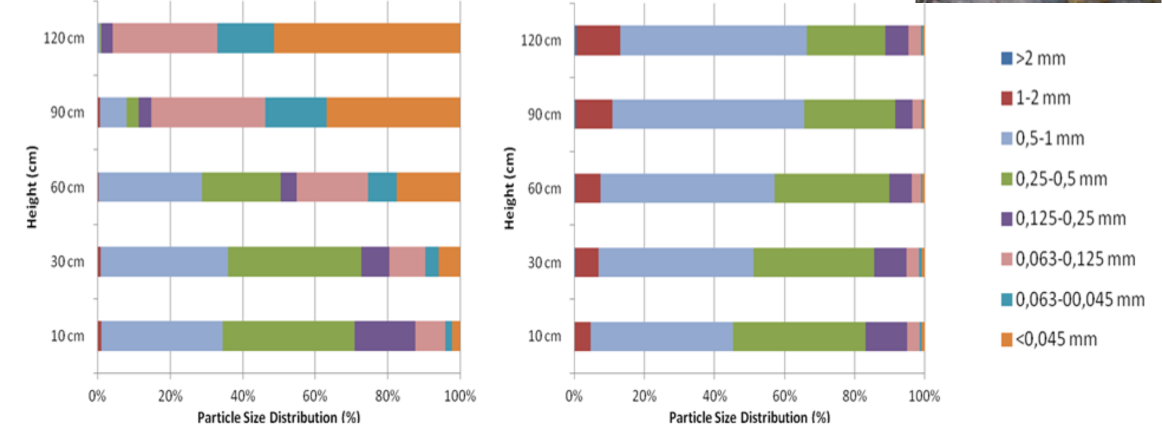
- **AEOLIAN TRANSPORT** OVER ONE METER TRANSECT **> 11,800 KG M^{-1}**
- THIS STORM IS AMONG THE MOST EXTREME WIND EROSION EVENTS RECORDED ON EARTH
- FRESHLY DEPOSITED ASH PROLONGS IMPACTS OF VOLCANIC ERUPTIONS

SCIENTIFIC REPORTS

OPEN

An extreme wind erosion event of the fresh Eyjafjallajökull 2010 volcanic ash





2. A SNOW-DUST STORM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ELSEVIER

Snow–Dust Storm: Unique case study from Iceland, March 6–7, 2013

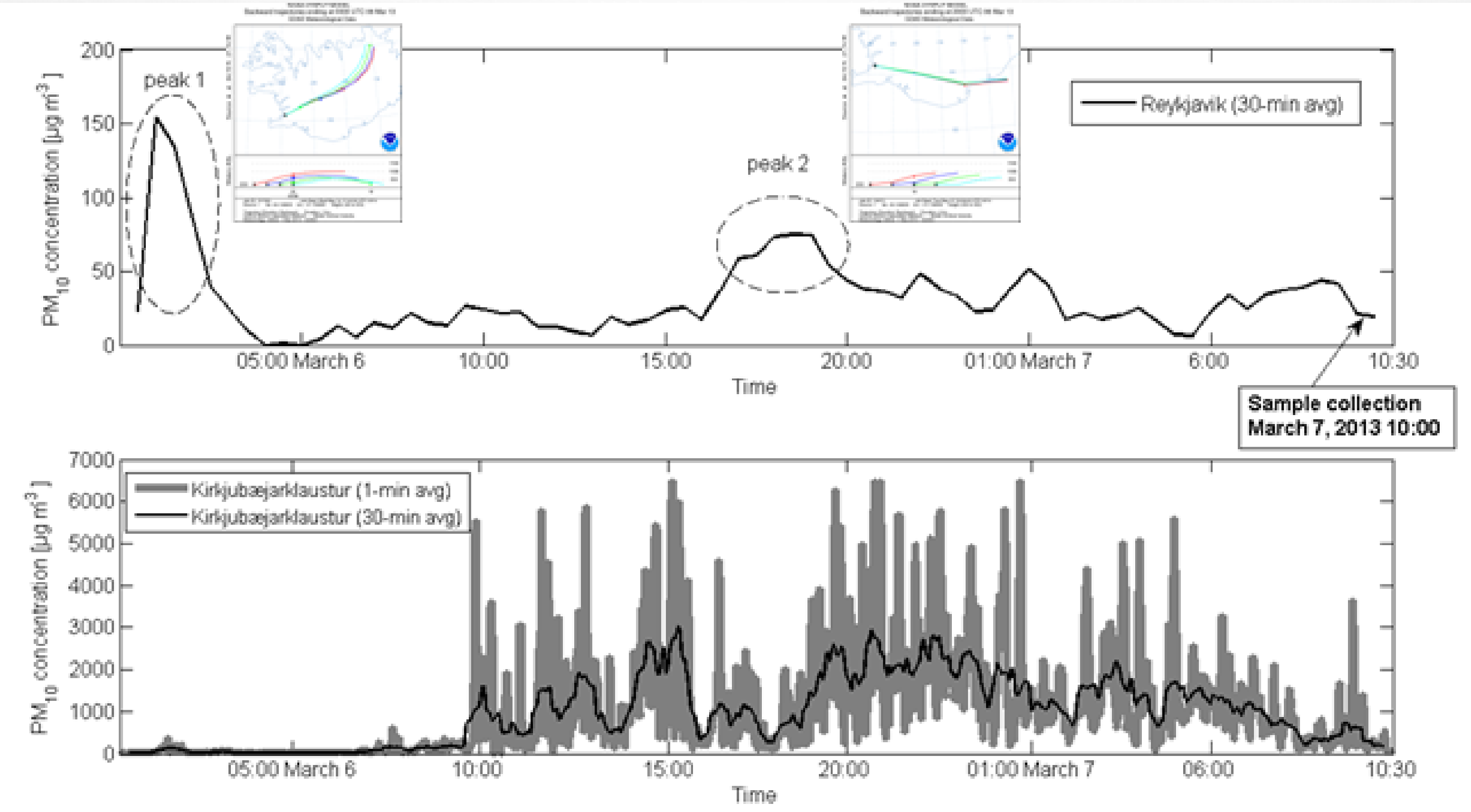
CrossMark

Pavla Dagsson-Waldhauserova [a,b,g,*], Olafur Arnalds [a], Haraldur Olafsson [b,c,d], Jindrich Hladil [e], Roman Skala [e], Tomas Navratil [e], Leona Chadimova [e], Outi Meinander [f]

Reykjavík (250 km from the source)

A SNOW-DUST STORM

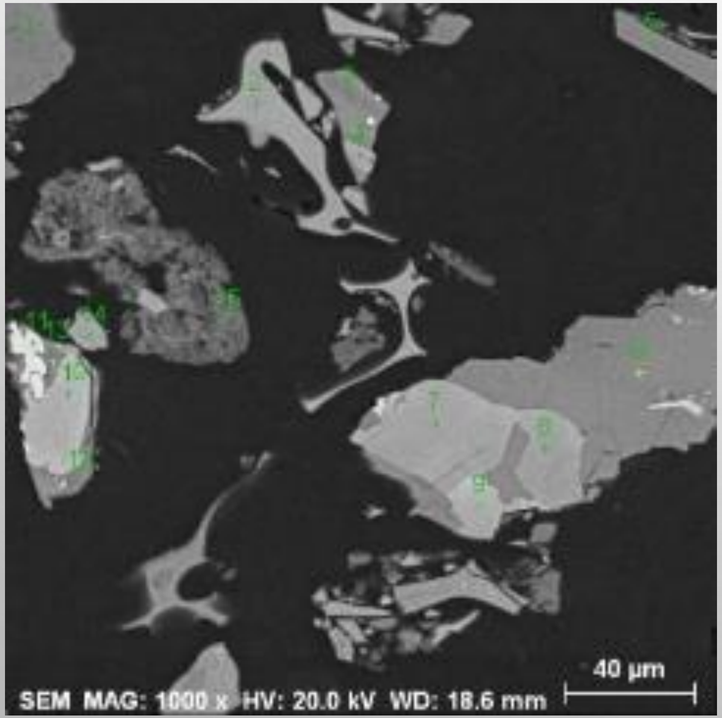
- Mean (median) PM_{10} concentration during 24-hour storm ~ 1,281 (1,170) µg m^{-3}
- Max one-minute PM_{10} concentration ~ **6500 µg m^{-3}**

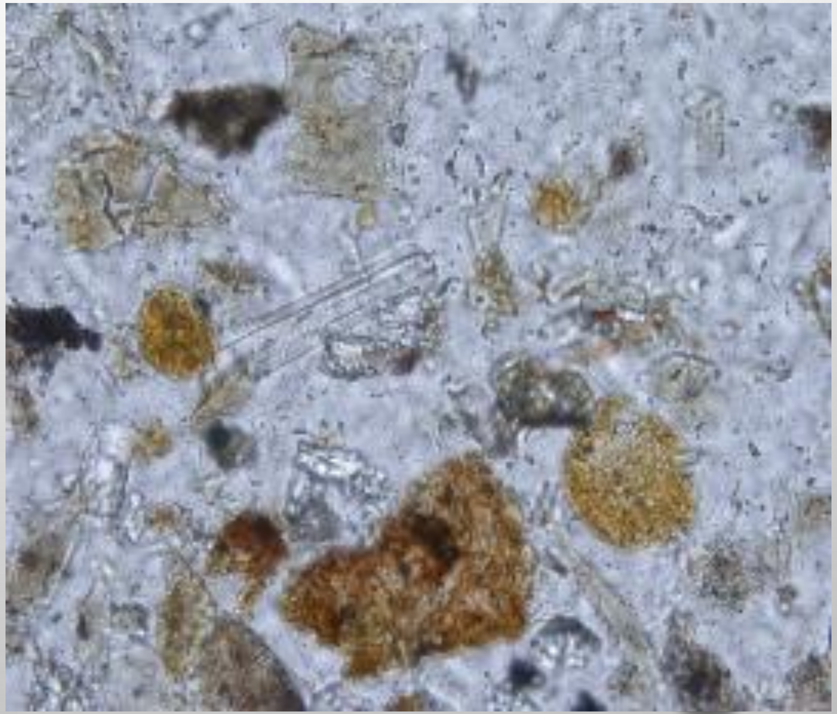


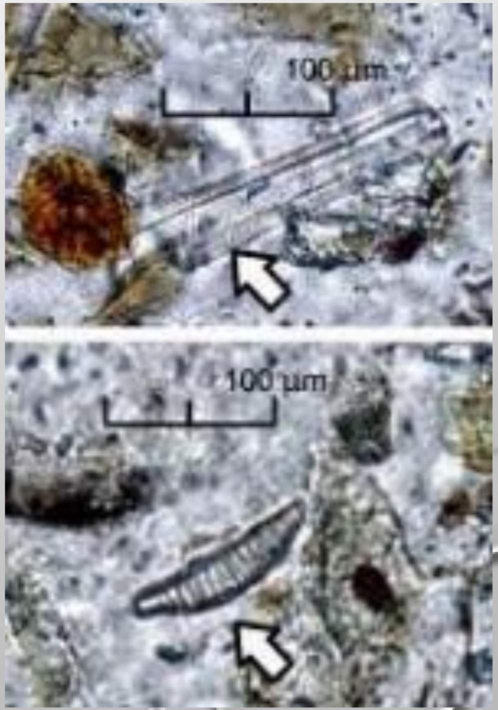
A SNOW-DUST STORM

Mineral and geochemical composition:

- 75% ~ volcanic glass
- SiO_2 45%, FeO 14.5%, TiO_2 3.5%
- high proportion of organic matter and diatoms
- very fine pipe-vesicular structures of glasses







A SNOW-DUST STORM

Clumping mechanism of particles on snow

the first observation reported from natural conditions

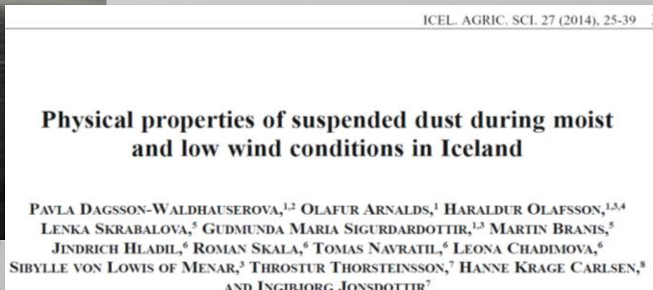
3. SUSPENDED DUST DURING MOIST AND LOW WIND CONDITIONS

- DUST EVENT AS RESULT OF SURFACE HEATING IN AUGUST 2013
- Max particle number concentration (PM~0.3-10 µm) reached 149,954 particles cm^{-3} min^{-1} while mass concentration PM_{10} was 1757 µg m^{-3} min^{-1}
- THE PARTICLES WERE MAINLY OF THE CLOSE-TO-ULTRAFINE SIZE (highest number of particles in size range **0.3-0.337 µm**)
- ~ 80 % of the glaciogenic dust is volcanic glass (with bubbles) rich in heavy metals
- WET DUST PARTICLES WERE MOBILIZED WITHIN < 4 HOURS


Mælifellssandur dust storm iniciation during dry summer 2012, © Oli Arnalds

L: The surface exposed to solar radiation for four hours **R:** Surface heating resulted in cloud formation and upward air motion

Source: Dagsson-Waldhauserova et al., 2014. **Physical properties of suspended dust during moist and low-wind conditions in Iceland**. Icelandic Agric. Sci. 27, 25–39.


ICEL. AGRIC. SCI. 27 (2014), 25-39

Physical properties of suspended dust during moist and low wind conditions in Iceland

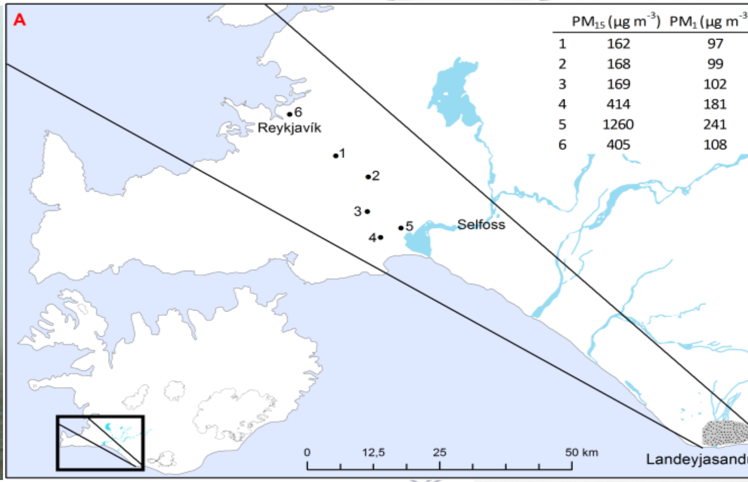
PAVLA DAGSSON-WALDHAUSEROVA,[1,2] OLAFUR ARNALDS,[1] HARALDUR OLAFSSON,[1,3,4] LENKA SKRABALOVA,[5] GUDMUNDA MARIA SIGURDARDOTTIR,[1,3] MARTIN BRANIS,[5] JINDRICH HLADIL,[6] ROMAN SKALA,[6] TOMAS NAVRATIL,[6] LEONA CHADIMOVA,[6] SIBYLLE VON LOWIS OF MENAR,[3] THROSTUR THORSTEINSSON,[7] HANNE KRAGE CARLSEN,[8] AND INGIBJORG JONSDOTTIR[7] *atmosphere*

MDPI

Article

The Spatial Variation of Dust Particulate Matter Concentrations during Two Icelandic Dust Storms in 2015

Pavla Dagsson-Waldhauserova [1,2,3,*], Agnes Ösp Magnusdottir [1], Haraldur Olafsson [2,4] and Olafur Arnalds [1]



atmosphere

Table 1. Particulate matter concentrations PM_{1-15} (μgm^{-3}) for both storms. Ratios between different PM values are given.

	PM_1 Average	$PM_{2.5}$ Average	PM_4 Average	PM_{10} Average	Total (PM_{15}) Average	PM_1/PM_{10} Ratio	$PM_{2.5}/PM_{10}$ Ratio	$PM_1/PM_{2.5}$ Ratio	PM_1/PM_4 Ratio	PM_4/PM_{10} Ratio	PM_{10}/PM_{15} Ratio
Storm 1											
1	97	109	130	158	162	0.61	0.69	0.89	0.75	0.82	0.98
2	99	110	130	158	168	0.63	0.70	0.90	0.76	0.82	0.94
3	102	114	137	163	169	0.63	0.70	0.89	0.74	0.84	0.96
4	181	201	248	354	414	0.51	0.57	0.90	0.73	0.70	0.86
5	241	263	322	583	1260	0.41	0.45	0.92	0.75	0.55	0.46
6	108	118	142	224	405	0.48	0.53	0.92	0.76	0.63	0.55
Storm 2											
1	11	12	14	29	71	0.48	0.53	0.92	0.76	0.63	0.55
2	4	4	5	7	10	0.38	0.41	0.92	0.79	0.48	0.41
3	12	13	16	29	42	0.57	0.57	1.00	0.80	0.71	0.70
4	57	61	74	162	383	0.41	0.45	0.92	0.75	0.55	0.69
5	164	174	206	486	1600	0.35	0.38	0.93	0.77	0.46	0.42
6	128	140	177	318	436	0.34	0.36	0.94	0.80	0.42	0.30
7	35	39	48	87	143	0.40	0.44	0.91	0.72	0.56	0.73

AIR BORNE MEASUREMENTS WITH LOAC (LIGHT OPTICAL AEROSOL COUNTERS)

Morgunblaðið

100 ÁRA

FÖSTUDAGUR 8. NÓVEMBER 2013

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STOFNAÐ 1913

VILL DRAGA ÚR SYKURNEYSLU UNGS FÓLKS

HOLLARI SMÁKÖKUR 10

ARNAR KVEÐUR ÞJÓÐLEIKHÚSIÐ FORMLEGA

NÆR SÁRSAUKAMÖRKUM

BESTI SÖNGVARINN Í MÚSÍKTILRAUNUM FRÁ STOKKSEYRI

100 DAGA HRINGFERÐ 21

Morgunblaðið/Gunnar

Kolgrafafjörður Dauð síld í hrönnum.

Mismunandi aðgerðir gætu kostað 60-800 milljónir

■ Kynntar hafa verið í ríkisstjórn hugmyndir um aðgerðir í Kolgrafafirði til að koma í veg fyrir síldardauða þar. Fjórar leiðir eru helst taldar koma til greina, en eftir er að útfæra þær allar.

Samkvæmt grófu mati er talið að kostnaður við að opna fjörðinn og gera nýja brú á vegfyllingu myndi kosta um 800 milljónir. Lokun fjarðarins er talin geta kostað 5-600 milljónir, en báðar þessar framkvæmdir tækju nokkurn tíma. Þriðja leiðin er um 1100 metra girðing utan brúar með veifum til að fæla síldina frá. Slík lausn er talin kosta 60-80 milljónir. Fjórða leiðin er að dæla súrefni í fjörðinn þegar vart verður við súrefnisskort. »18

Fyrirtæki í Hong Kong með .is-lén

■ Greiðslumiðlunarfyrirtækið Perfect Money í Hong Kong er eitt af þúsundum erlendra aðila sem hafa kosið að skrá vefsíðu sína undir höfuðléninu .is.

Að sögn Jens Péturs Jensen, framkvæmdastjóra Internets á Íslandi (ISNIC), völdu forsvarsmenn Perfect Money .is-lén fyrir greiðslugættina vegna traustsins sem það nýtur. Síðan mun nýta DNSSEC-öryggiskerfið sem ISNIC er nýbyrjað að bjóða upp á fyrir .is-lén.

Aðilar með aðsetur erlendis eru rétthafar um fjórðungs allra .is-léna. Tekjur af útflutningi á lénum hafa komið íslenskum rétthöfum til góða en unnt hefur verið að lækka gjöld fyrir lénin vegna þeirra. »26

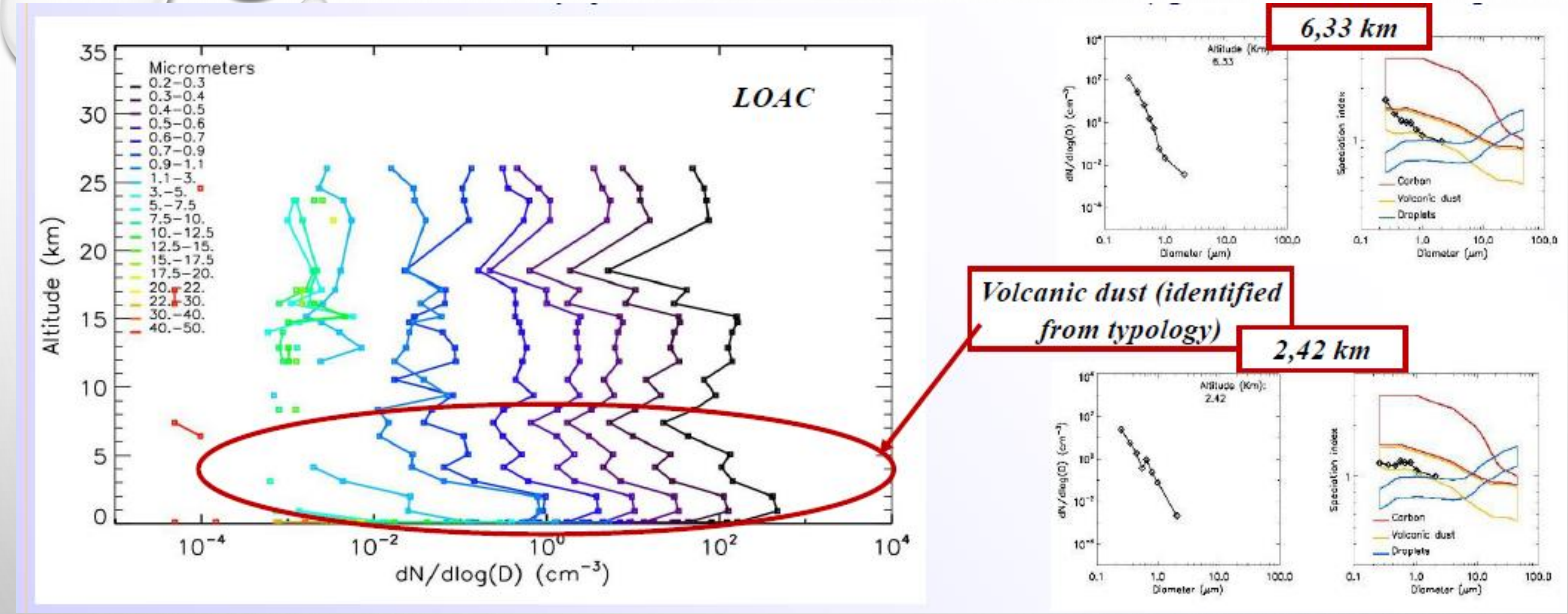
Loftbelgur ber tæki sem mælir agnir í andrúmsloftinu á leið hans upp í háloftin

Morgunblaðið/RAX

Loftið mjög tært þegar komið var í 1.000 metra hæð

Unnið er að því að þróa nýjar aðferðir til að greina örsmáar ryk- og öskuagnir í andrúmsloftinu. Hér á landi starfa að verkefninu Pavla Dagsson Waldhauserová doktorsnemi og Haraldur Ólafsson, veðurfræðingur og prófessor.

Loftbelgur ber á loft lítið tæki. Það dregur í sig andrúmsloft, lýsir á það með leysigeisla og mælir endurkast frá ögnunum. Loftmælitæki var sent á loft í gær og var reiknað með að það færi í 30-35 km hæð. Ísing olli því að belgurinn fór ekki nema í 22 km hæð og féll svo í miðjan Hvalfjörðinn. Tækið sýndi dálítið af ryki upp í um 200 metra hæð en fyrir ofan 1.000 metra var mjög tært loft. Búnaðinn má nota til að mæla ösku frá eldgosum og aðrar agnir í loftinu.



- The number concentration exceeded 200 particles cm^{-3} at altitude of 1 km and 60 particles cm^{-3} at altitude of 5 km (at least 5 times higher than during background conditions)
- The particles were < 3 µm in size at altitudes >1 km while largest particles, up to 20 µm, were detected close to the ground
- Such high number concentrations in several km height were captured by LOAC during a typical Saharan dust plume.

OPTICAL PROPERTIES OF VOLCANIC DUST PARTICLES COMPARED TO BLACK CARBON

CRYOSPHERE – ATMOSPHERE INTERACTIONS

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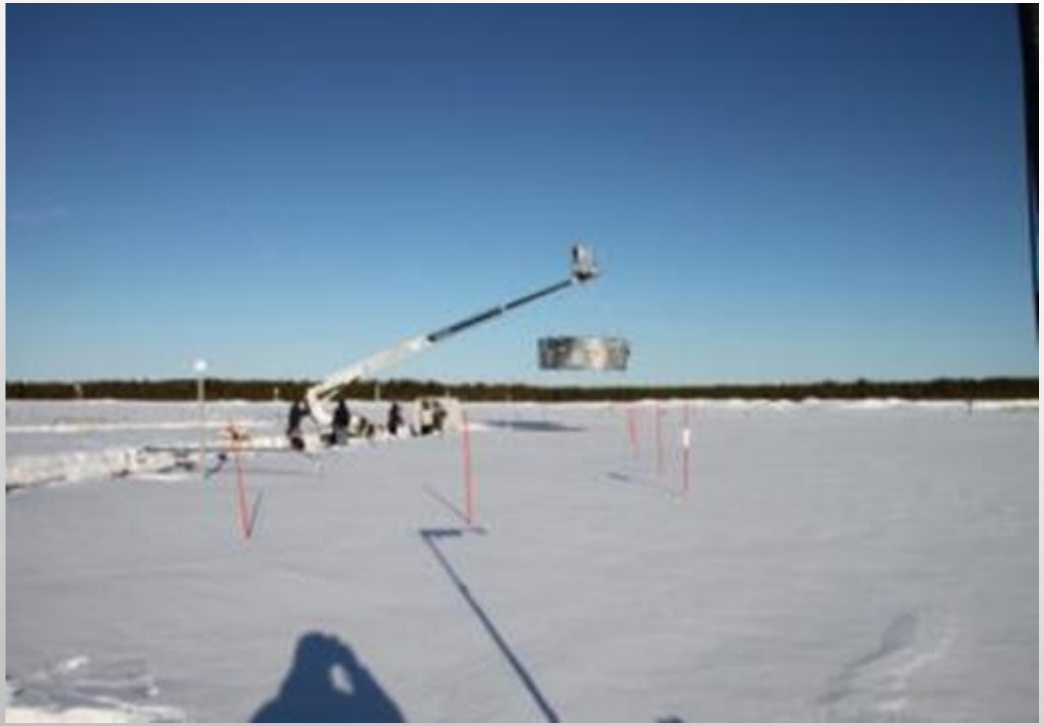
ISLANDIA.
Septemtrio
Meridies
Occidens
Oriens
BLOE
Glama
VVESTFIORDVNG
NORDLEN DINGAFIOR DVNG.
Arnafelds Iokul
Getlands Iokul
Bald Iokul
Skalbred
SVNDLEN DINGAFIOR DVNG.
Hekla
AVSTLENDIN GAFIORDVNG
Sneuels Iokul
Medalland
ILLVSTRISS. AC POTENTISS.
REGI FREDERICO II DANIAE,
NORVEGIAE, SLAVORVM, GO
THORVMQVE REGI, ETC. PRIN
CIPI SVO CLEMENTISSIMO.
ANDREAS VELLEIVS
DESCRIBEB. ET DEDICABAT.

IMPURITIES ON SNOW

SOOT ON SNOW PROJECT IN LAPLAND
SOS 2013

FIELD EXPERIMENTS COMPARING THE ABSORBING IMPURITIES DEPOSITED ON SNOW



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LANDBÚNAÐARHÁSKÓLI ÍSLANDS

UNIVERSITY OF ICELAND

FINNISH GEODETIC INSTITUTE

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

Key measurement components:

1. Snow

Primarily component for the experiment. Natural snow pack at Sodankylä airport. Begining of April, 2013

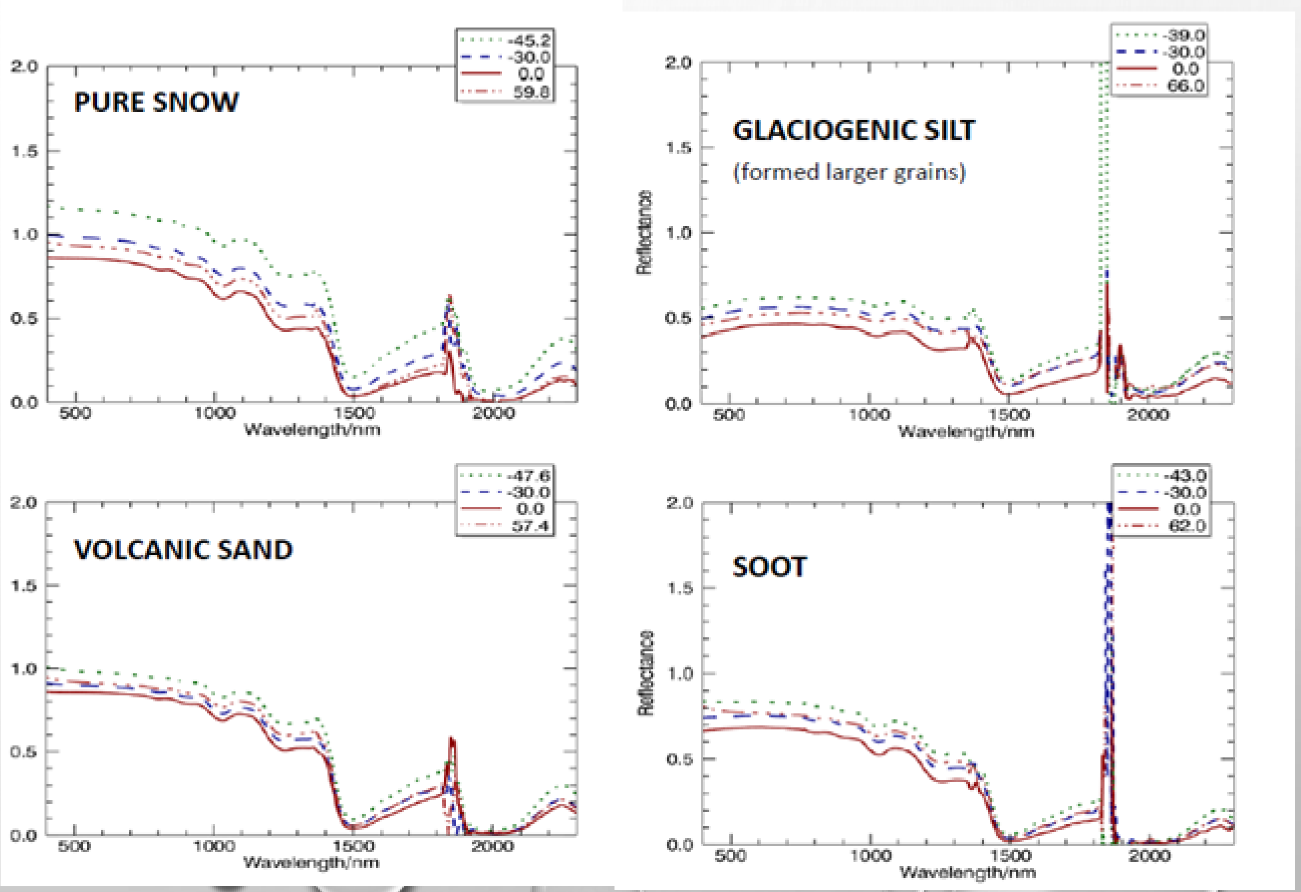
2. Volcanic sand

A near black mixture of the volcanic ash of glaciofluvial nature. Origin: under the Myrdalsjokull glacier

3. Glaciogenic silt

Collected from the glacial river Mulakvisl, it consists mainly of silt and some coarse clay sized particles

SPECTRAL REFLECTANCE AT THE TIME OF THE DEPOSITION

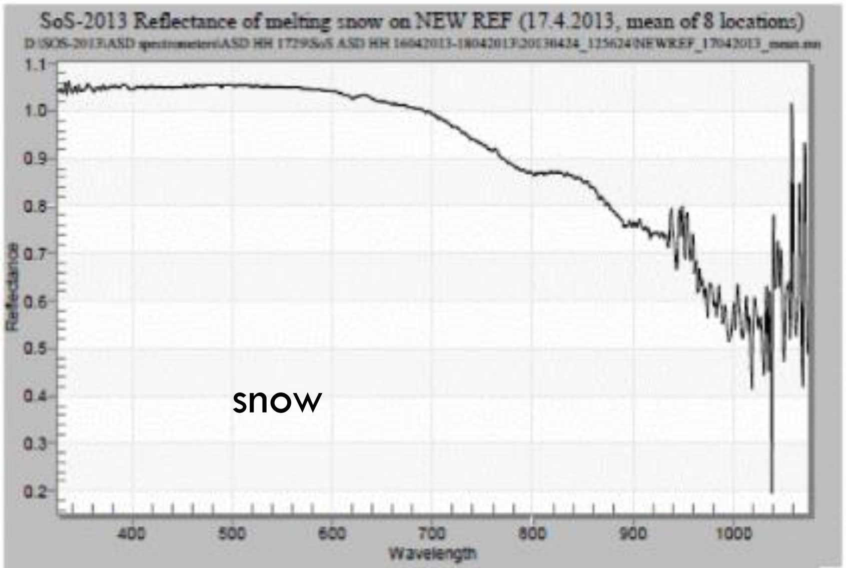


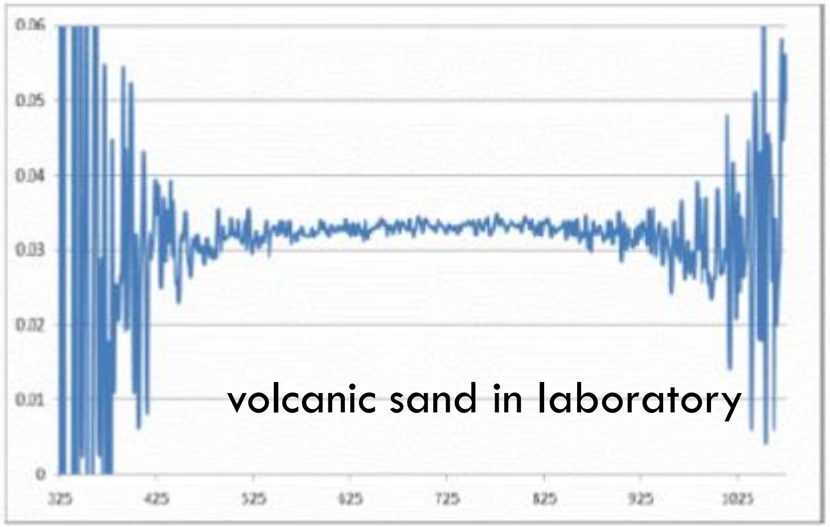
CLUMPING MECHANISM

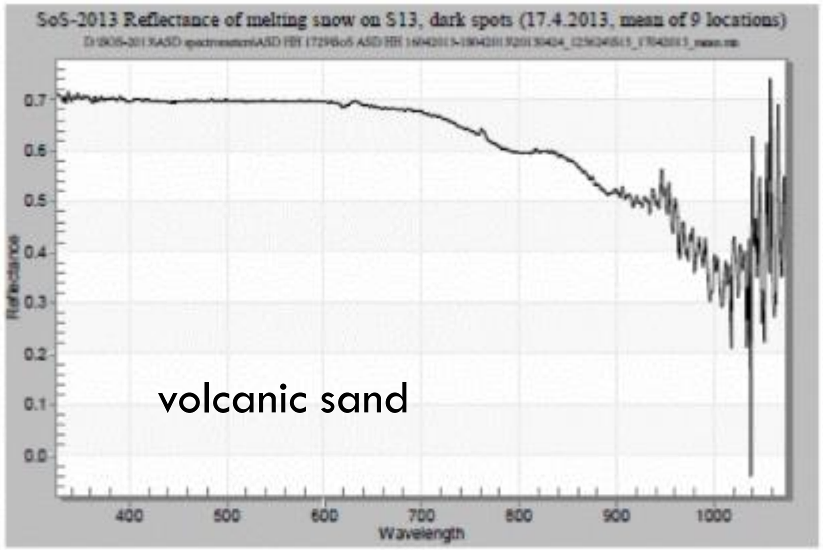
SILT

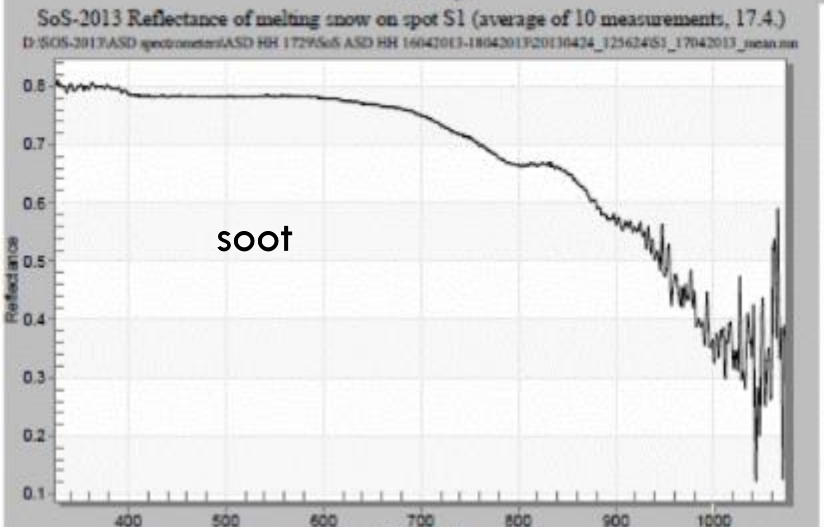
SOOT

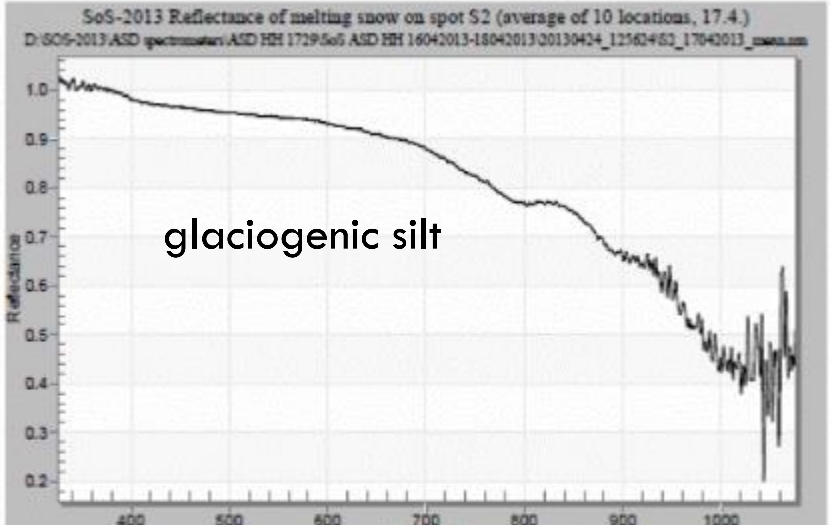
REFLECTANCE MEASUREMENTS TWO WEEKS AFTER THE DEPOSITION

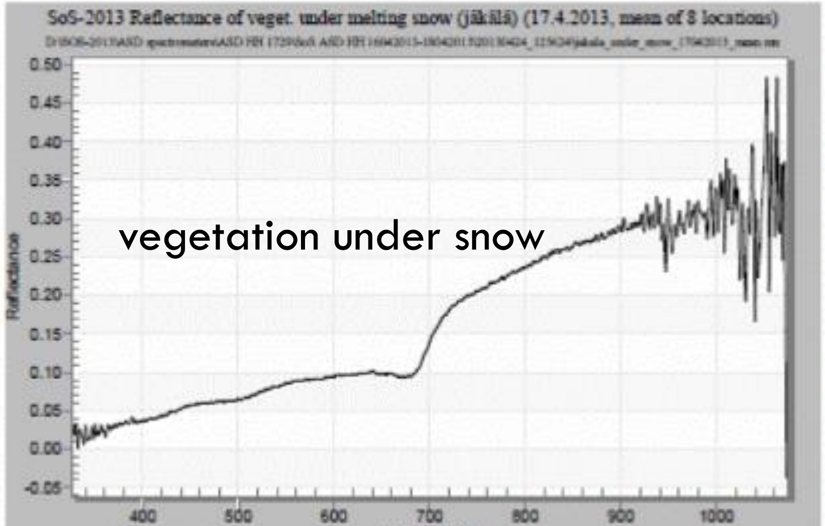












The Cryosphere, 9, 2323–2337, 2015
www.the-cryosphere.net/9/2323/2015/
doi:10.5194/tc-9-2323-2015

Soot on Snow experiment: bidirectional reflectance factor measurements of contaminated snow

J. I. Peltoniemi[1,2], M. Gritsevich[1,2,8], T. Hakala[1], P. Dagsson-Waldhauserová[5,6,7], Ó. Arnalds[6], K. Anttila[1,3], H.-R. Hannula[4], N. Kivekäs[3], H. Lihavainen[3], O. Meinander[3], J. Svensson[3,9], A. Virkkula[3], and G. de Leeuw[2,3]

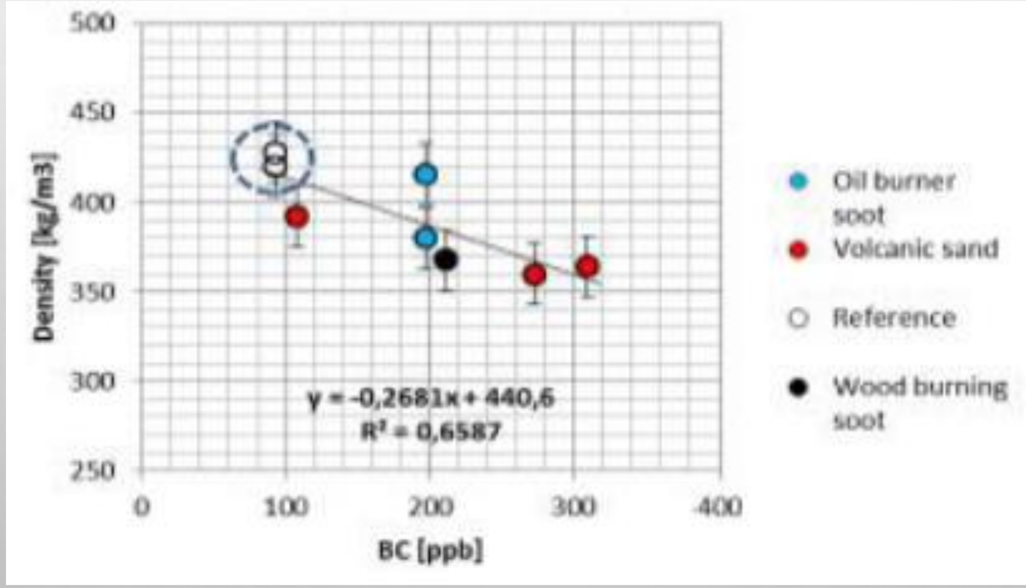
Soot On Snow (SOS) 2013

The Cryosphere, 8, 991–995, 2014
www.the-cryosphere.net/8/991/2014/
doi:10.5194/tc-8-991-2014

Brief communication: Light-absorbing impurities can reduce the density of melting snow

O. Meinander[1], A. Kontu[2], A. Virkkula[1], A. Arola[2], L. Backman[1], P. Dagsson-Waldhauserová[4,5], O. Järvinen[6], T. Manninen[1], J. Svensson[1], G. de Leeuw[1,6], and M. Leppäranta[6]

- VOLCANIC DUST DECREASES SNOW ALBEDO SIMILARLY AS BLACK CARBON
- IN LAB, VOLCANIC DUST IS AN EXTREMELY ABSORBING AEROSOL (SR=0.03)
- SOOT DECREASES WATER RETENTION CAPACITY AND DENSITY OF SNOW



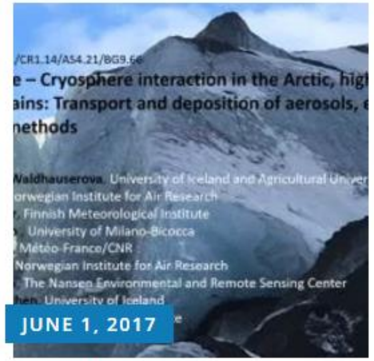
Icelandic Aerosol and Dust Association (IceDust)

Rykrannsóknafélag Íslands (RykÍS)

Home | About | Who we are? | Past events | Publications | Contact | Open positions | Witnessed a dust storm?

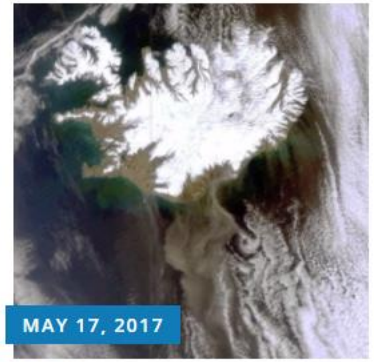
JUNE 7, 2017

International conference on High Latitude Dust in Reykjavik



JUNE 1, 2017

Our 'Atmosphere – Cryosphere interaction session' at the EGU for the first time



MAY 17, 2017

Welcome to new website of IceDust

Search for topic on IceDust

Search …

Upcoming Dust Events

No upcoming events

Dust Storms in Iceland

Public Group

European Geosciences Union General Assembly 2017

Vienna | Austria | 23–28 April 2017

EGU.eu

Orals IE1.1/CR1.14/AS4.21/BG9.66

IE1.1/CR1.14/AS4.21/BG9.66 Media

Atmosphere – Cryosphere interaction in the Arctic, high latitudes and mountains: Transport and deposition of aerosols, eScience and ensemble methods (co-organized)

Convener: Pavla Dagsson Waldhauserova

Co-Conveners: Biagio Di Mauro, Marie Dumont, Andreas Stohl, Alberto Carrassi, Helmut Neukirchen, Ignacio Pisso

HTTPS://ICEDUSTBLOG.WORDPRESS.COM/

Landbúnaðarháskóli Íslands
Agricultural University of Iceland

UNIVERSITY OF ICELAND

CONCLUSIONS

- ICELAND IS THE LARGEST EUROPEAN AND ARCTIC DESERT
- DUST DAY FREQUENCY IS COMPARABLE TO THE MAJOR DESERTS OF THE WORLD
- ICELANDIC DUST IS DIFFERENT TO CRUSTAL DUST
  - THE MOST EXTREME DUST EVENTS
  - OPTICAL PROPERTIES ARE SIMILAR TO BLACK CARBON
  - IT IS VERY FINE AND SHARP
- DUST IN ICELAND CAN:
  1. PROLONG THE EFFECTS OF VOLCANIC ERUPTION
  2. CONTRIBUTE IN A SNOW-DUST STORM
  3. BE SUSPENDED DUST DURING MOIST AND LOW WIND CONDITIONS


Aeolian Research 20 (2016) 176–195

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journal homepage: www.elsevier.com/locate/aeolia

ELSEVIER

Review article

The Icelandic volcanic aeolian environment: Processes and impacts – A review

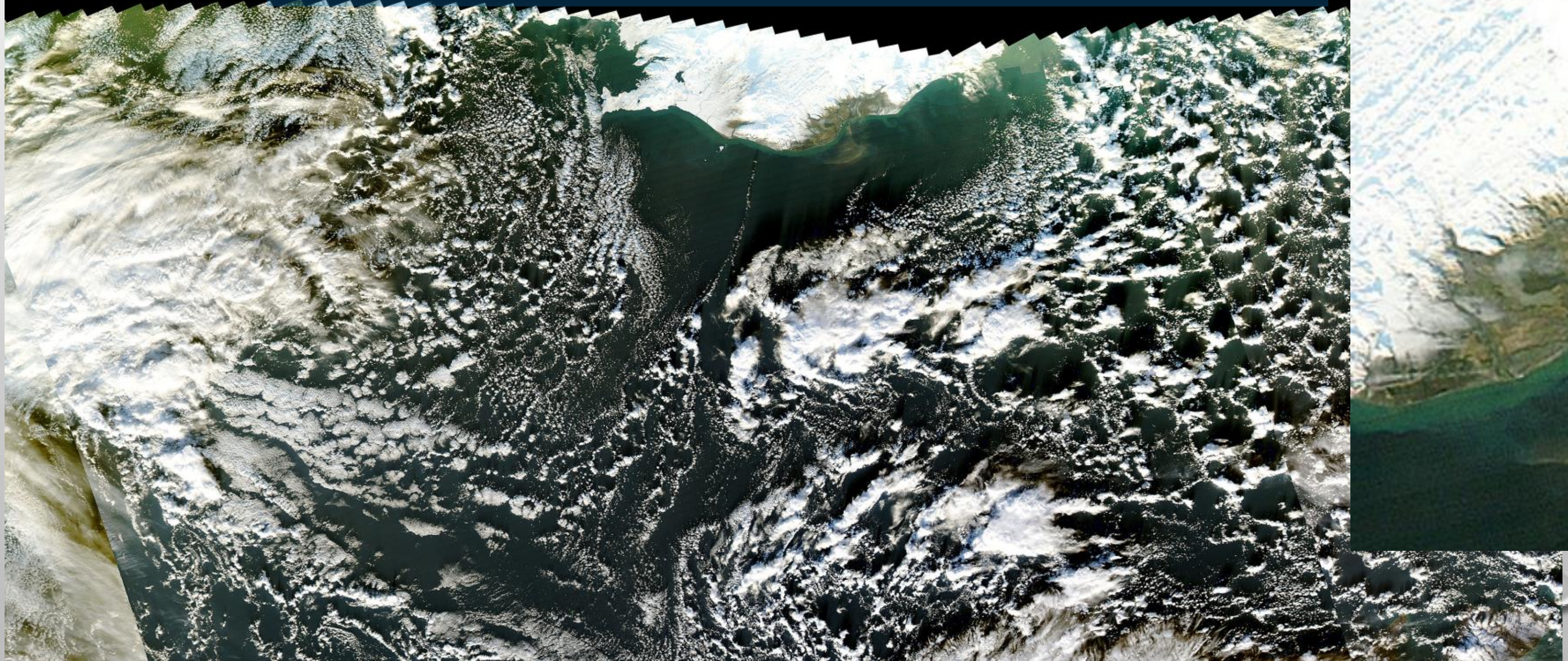
Olafur Arnalds [a,b,*], Pavla Dagsson-Waldhauserova [a,c,d], Haraldur Olafsson [d,e]

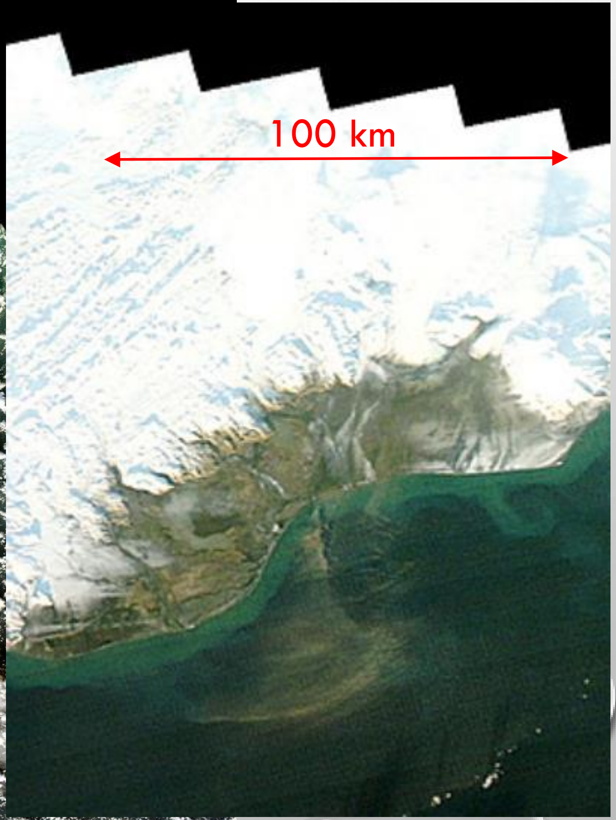
The largest desert in Europe and Arctic is …?

THANK YOU FOR YOUR ATTENTION!

pavla@lbhi.is

Snow does not give limitations for dust suspension!
Cold times, dusty times!
MODIS Aqua, S Iceland, January 13, 2016





The Cryosphere, 8, 991–995, 2014
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The Cryosphere Open Access

Brief communication: Light-absorbing impurities can reduce the density of melting snow

O. Meinander[1], A. Kontu[2], A. Virkkula[1], A. Arola[3], L. Backman[1], P. Dagsson-Waldhauserová[4,5], O. Järvinen[6], T. Manninen[1], J. Svensson[1], G. de Leeuw[1,6], and M. Leppäranta[6]

1. *A semi-direct effect of absorbing impurities*. Absorbing impurities would cause melt and/or evaporation from the liquid phase and sublimation from the solid phase of the surrounding snow, resulting in air pockets around the impurities, and thus lower snow density. We have empirical observations, where impurities (both organic and inorganic) in the snow have been surrounded by air pockets.

2. *BC effect on the adhesion between liquid water and snow grains*. If BC reduces adhesion, the liquid-water holding capacity decreases. For linear warming the influence on the density of wet snow is then max 5 % (at this level water flow starts in natural snow). However, with daily cycles, warm days and cold nights, the weaker adhesion may push liquid water down more day-by-day and then the influence to the density would be larger. This way also melt–freeze metamorphosis would produce less dense snow.

3. *BC effect on the snow grain size*. Absorbing impurities would increase the melting and metamorphosis processes, resulting in larger snow grains, which would lower the water retention capacity. Earlier, Yamaguchi et al. (2010) have suggested that the water retention curve of snow could be described as a function of grain size using soil physics models. Here our data showed some slight indication for the possibility of soot in snow to result in larger snow grain sizes via increased melt and metamorphosis, and our data did not show clear evidence against this possibility.