**ICE COVERAGE: The Global Thaw**

**Climate change is real and one of the better known effects is the melting of the polar ice caps. But melting ice can be found all around our planet and not only in the polar regions. This global trend of melting ice caps, glaciers, sea ice, and permafrost is a worrying one. It impacts our planet on a number of levels ranging from facilitating climate change itself, to loss of drinking water and impacting agriculture dependent on glacial meltwater. The global thaw will have enormous consequences in the future for life on Earth.**

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| 10:00:00 | ESA leader |
| 10:00:10 | Title: **ICE COVERAGE: The Global Thaw** |
| 10:00:10:00   * Ext. Earth-rise seen by Kaguya spacecraft – 05/04/2008 – JAXA * Ext. earth from the ISS – unknown data-ESA/NASA * Animation. Sentinel-3 fly-by – unknown data – ESA * Animation. Sentinel-2 360° fly around – unknown date – ESA * Animation. Greenland ice loss – unknown date – IMBIE * Ext. Floating ice sheet, Svalbard, Norway – Winter 2019 – ESA * Ext. Aerial snow covered mountain ridge – unknown polar region – unknwon date – Videoblocks * Ext. floating sea ice, Svalbard, Norway – Winter 2019 – ESA * Sat. data Brunt Ice Shelf timeseries – feb 2019 – ESA * Sat. data Columbia Glacier 1986 – 2017 – 2017 – ESA | **Climate change is impacting our planet and society as never before. This is why the European Space Agency is using earth observation satellites to measure and determine the consequences of human activity on a global scale. One of the most damaging effects seen from Space is the global trend of melting ice on our planet. This ice is called the cryosphere. It is comprised of ice sheets such as the Antarctic, sea ice like in the Arctic, but also of glaciers and permafrost regions. While the melting of the ice sheets of Antarctica and Greenland are the best known examples, Satellite measurements indicate that in the last half century glaciers across the globe have also lost a significant amount of ice.** |
| 10:00:56:00   * Sat. data Columbia Glacier 1986 – 2017 – 2017 – ESA * INT. Mark Drinkwater, Head of Earth & Mission Science division – April 2019 - ESA | **ITW Mark Drinkwater, Head of Earth & Mission Science Division, ESA**  Over the course of the last century we have seen quite dramatic changes in these different elements of the cryosphere. Notably we’ve seen significant losses in Arctic sea ice, we’ve seen decline in the volume of ice locked up in glaciers and we have also been witnessing it in the large ice sheets, Greenland and Antarctica. The consequence of course is that sea level is rising as water is transferred from ice on land into the ocean. |
| 10:01:24:14   * Ext. Sea surf Noordwijk, The Netherlands – April 2019 – ESA * Ext. Aerial vatnajokull Glacier, Iceland – unknown date - videoblocks * Sat. Data, glacier retreat Southeast Greenland, seasat-sentinel-1 – 2014 – ESA * Animation. Patagonian glaciers melting – 2017 – Planetary Visions * Ext. Aerial ocean view, The Azores - Spring 2018 – ESA * Ext. flooding Thailand – unknown date – Videoblocks * Ext. Stormy weather – unknown date – videoblocks * Ext. Storm at sea – unknown date – Videoblocks * Ext. Nepalese villages at the Himalaya – unknown date - Videoblocks | **While half of the sea level rise comes from thermal expansion caused by warming ocean water. Melting glacier ice is the second largest contributor. Research shows that over the last 50 years glaciers have lost more than nine trillion tonnes of ice raising sea-level by 2,7 cm. Although yearly data measurements may fluctuate, a global trend is visible whereby the rate of ice loss has increased. At the current rate about three times the volume of all ice stored in the European Alps is lost every year. This corresponds to around 30% of the current rate of sea-level rise. While rising sea-levels are threatening many coastal areas across the world with severe flooding and more extreme storms, melting glaciers will also impact people living downstream of these glaciers who depend on this seemingly eternal water resource especially during the summer or dry season.** |
| 10:02:26:21   * INT. Mark Drinkwater, Head of Earth & Mission Science division – April 2019 – ESA | **ITW Mark Drinkwater, Head of Earth & Mission Science Division, ESA**  Glaciers have a huge impact on the population on earth in particular in south-east Asia where millions of people are dependent on mountain water resources. During the summer season we see the melting of the glacier and the mountain snowpack, this of course releases water which is used for irrigation in the fields it is used for generating hydro-electric power and is also used for drinking water. And so we are very much concerned with how climate warming has an impact on the seasonal streamflow and the way the water resource can managed in the future. |
| 10:03:03:11   * Sat. Data Glacier retreat Skikkim, India – unknown date – ESA * Sat. Data Jacobshavn Glacier retreat – unknown date – ESA * Animation. Cryosat 360° fly around – unknown date – ESA * Animation. Sentinel-1 Fly-by – unknown date – ESA * Ext. Floating Iceberg, Antarctic Region – unknown date – Videoblocks * Graph. Global iceloss – unknown date – ESA * Ext. Flowing icefield Swis Alphs – unknown date – videoblocks * Ext. Athabasca glacier, Canada – unknown date – Videoblocks * Ext. Aerial winter forest – unknown date – Videoblocks * Ext. Aerial winter landscape – unknown date – Videoblocks * Animation. Globe with methane data – unknown date – ESA * Ext. Coastal region, Svalbard, Norway – unknown date - ESA | **From space several ESA’s earth observation satellites and the EU’s Copernicus satellites monitor our global ice cover. CryoSat for instance is dedicated to measuring the thickness of polar ice and changes in the ice sheets of Greenland and Antarctica, whereas Sentinel-1 is used to track sea ice. With this kind of satellite data going back more than 25 years, scientists can calculate the volume of ice loss on a global scale. It also furthers their climate models and allows them to make predictions about the rate and impact of future ice loss.**  **Another worrying aspect of the global thaw is the impact it has on permafrost. This is the almost permanently frozen ground around the Arctic regions. Scientist are concerned that when this ground thaws, methane that was trapped in the soil will be released into our atmosphere amplifying the greenhouse effect. But it is not the only self-replicating effect being triggered by the melting of snow and ice.** |
| 10:04:14:01   * INT. Mark Drinkwater, Head of Earth & Mission Science division – April 2019 – ESA | **ITW Mark Drinkwater, Head of Earth & Mission Science Division, ESA**  We talk about the impact of melting snow and ice in terms of what is known as the albedo effect. When snow is dry, it is very reflective and of course that helps to reflect sunlight back out into space; and the consequence is we can reduce the amount of melting this way. However as ice and snow melt, the albedo and the reflectivity becomes lower and this has the effect of absorbing more of the solar energy, this contributes to further warming and further melting. And so it is a runaway progressive effect caused by the reduction in the albedo. |
| 10:04:53:16   * Ext. Mountain region, Svalbard, Norway – unknown date – ESA * Ext. helicopter images, Greenland – unknow date – DMI * Int. DMI offices making of icecharts – March 30th 2016 – ESA * Sat. Data Larsen Iceshelf - unknown date – ESA * Ext. Aerial snow covered mountain village – unknown date – Videoblocks * Ext. floating sea ice, Svalbard, Norway – Winter 2019 – ESA * Sat. Data Panmah and Choktoi Glacier, Pakistan – unknown date – ESA * Ext. Aerial mountain village, Asia – unknown date - videoblocks | **It is clear that monitoring our planet’s cryosphere is of great importance as it influences the lives of millions of people. The European Space Agency recognizes this and already looks towards the future. Three of the six high priority candidate Sentinel missions are aimed at addressing urgent climate and operational user needs related to ice sheets, snow and sea ice. With these tools, from space we can look at our planet and see which policies are needed to slow the global thaw.** |
| **10:05:30:24** | **BR\_001** |
| **10:11:01:23** | **BR\_002** |
| * INT. Mark Drinkwater, Head of Earth & Mission Science division – April 2019 – ESA | **ITW Mark Drinkwater, Head of Earth & Mission Science Division, ESA**   * Impact of climate change on the cryosphere * Impact of melting ice on communities * Critical mountain glacier loss * Cause of sea level rise * Different consequences of melting ice * Impact of ice melt and sea level rise * Monitoring the cryosphere from space * The use of satellite data * The Global thaw trend and accelerating sea level rise * Copernicus and ice |
| 10:20:54:22   * Ext. landscape, Svalbard, Norway – Winter 2019 – ESA | **BR\_003**  **GV’s Winter landscape, village**  **Svalbard, Norway**  **Winter 2019**  **ESA** |
| 10:26:04:23   * Ext. ESTEC, Noordwijk, The Netherlands – April 2019 – ESA | **BR\_004**  **GV’s Estec grounds**  **Noordwijk, The Netherlands**  **April 2019**  **ESA** |
| 10:26:51:09   * Ext. Noordwijk, The Netherlands – April 2019 – ESA | **BR\_005**  **GV’s Seaside and beach**  **Noordwijk, The Netherlands**  **April 2019**  **ESA** |
| 10:30:13:23 | **ESA End Credits** |
| **10:30:21:11** | **END of B-Roll** |