

**RemOs1: Beginning Data Work
in the Arctic Sea**
Hannes Rickli

The first time I came across the underwater fish observatory *RemOs1* (Remote Observation System) was in the summer of 2005 at Lake Constance where it was surveying and photographing the lairs of young perches. Meanwhile, the observatory and the working group around fish ecologist Philipp Fischer have moved to Heligoland in the North Sea, where *RemOs1* has been modified for salt water operation. For some time, the observatory has been operating in the Polar Sea close to Spitsbergen, approximately one thousand kilometers from the North Pole. For the long-term elicitation of environmental changes in maritime habitats, *RemOs1* was submerged in the sea close to the coast. Every half an hour, it delivers a stereometric pair of photographs and thus surveys the development of flora and fauna on a wall projecting out into the Kongsfjorden at Ny-Ålesund. The image pairs are transmitted via the Internet to Heligoland; the depicted organisms are then counted and registered by size.¹

My current work as a fine artist involves researching the electrical and digital activities of the media and infrastructure used in ecological research. How can these activities be observed? After all, they take place at the bottom of the sea, concealed inside the black boxes of digital meters, switches, and virtual computers. This question arises in many fields of contemporary technology-based and data-driven research. What is the role of electricity and its availability in remote locations of the earth? Is there an electrical creative leeway that, on the one hand, enables research and, on the other hand, limits it?

To transpose the working processes of the underwater observatory into the scope of human perception, in March 2012, my staff member Valentina Vuksic, an artist and computer scientist, together with an electrician, placed acoustic probes inside the device at the Alfred-Wegener-Institute on Heligoland (Helmholtz Center for Polar and Marine Research) before it was shipped to Spitsbergen. Similar to listening to organs with a stethoscope, induction coils were fitted to detect areas where the electrical activity of the devices generates electromagnetic fields. Adequate transformers pick

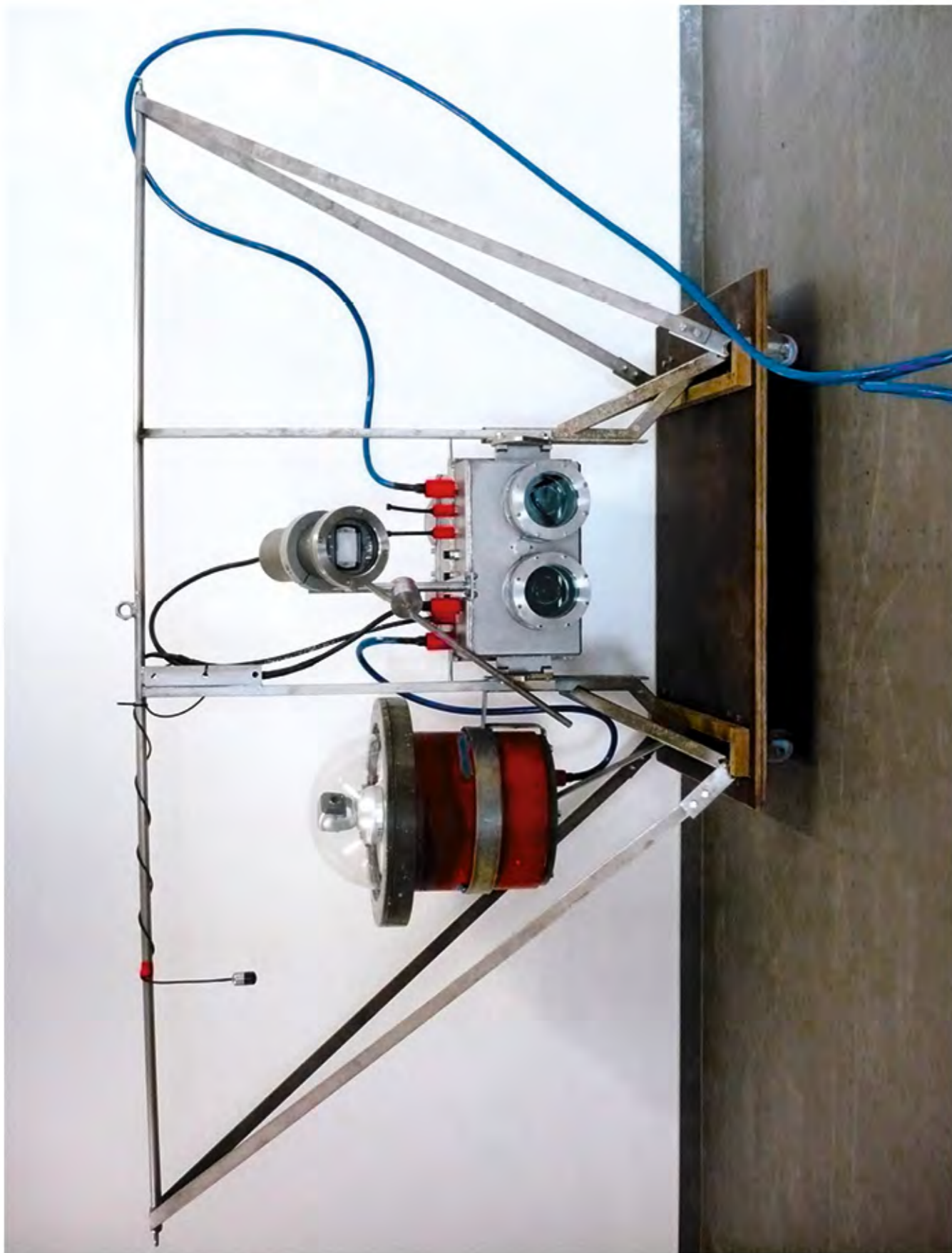
up the oscillations as acoustic signals. Specially applied bypasses were installed in the wiring to record power consumption. The electromagnetic oscillations of digital processes and the load-dependent variations in the power supply enable the registering of finely structured signal noise during rest routines. The single release moments of the cameras and the subsequent upload of image data through the onboard computer stand out against the constant ambient noise. Additionally, a contact microphone positioned on an attached webcam transmits the mechanical vibrations of the observatory body and the beating of the floatation devices against the casing when the sea is rough. The five audio signals (power consumption, camera, onboard computer, webcam, and external hydrophone) are recorded by an autonomous mini-computer (*Gumstix*) fitted with sound cards; the signals are then sent together with the stereometric images to a server run by the art project.

In June 2012, *RemOs1* was placed off the west coast of Spitsbergen at a remotely controllable depth between two and twelve meters and connected with the mainland station using steady power and glass-fiber cables. After an experimental phase, the observatory was recalibrated and lowered into the coastal waters on September 15, 2012. The art project has since stored approximately 30 gigabytes of audio and visual data every day. The series of archival stereometric images gathered in this publication (covering the period through September 19, 2014, 01:00:00) feature black gaps. These gaps occur due to slight shifts when synchronizing the two main cameras with the flash light, as much as due to mid- and long-term failures in power- and data connectivity. Furthermore, faulty communication between the networks of the participating institutions produces a loss of data. These failures point to precarious technical and environmental conditions under which the research is conducted. The varying lightness of the images reveals the swell and the marine snow (smallest organic particles in the water), which increase with rough sea and reflect the light of the flash. Also presented here are photographs taken during repair- and calibration work in the workshop.

The long-term elicitation of the *modus operandi* of *RemOs1*

off Spitsbergen is part of the artistic research project *Computer Signals: Art and Biology in the Age of Digital Experimentation*, which has been funded by the Swiss National Science Foundation (SNSF) since 2012 and is based at the Institute for Contemporary Art Research (IFCAR, www.ifcar.ch), Zurich University of the Arts (ZHdK).

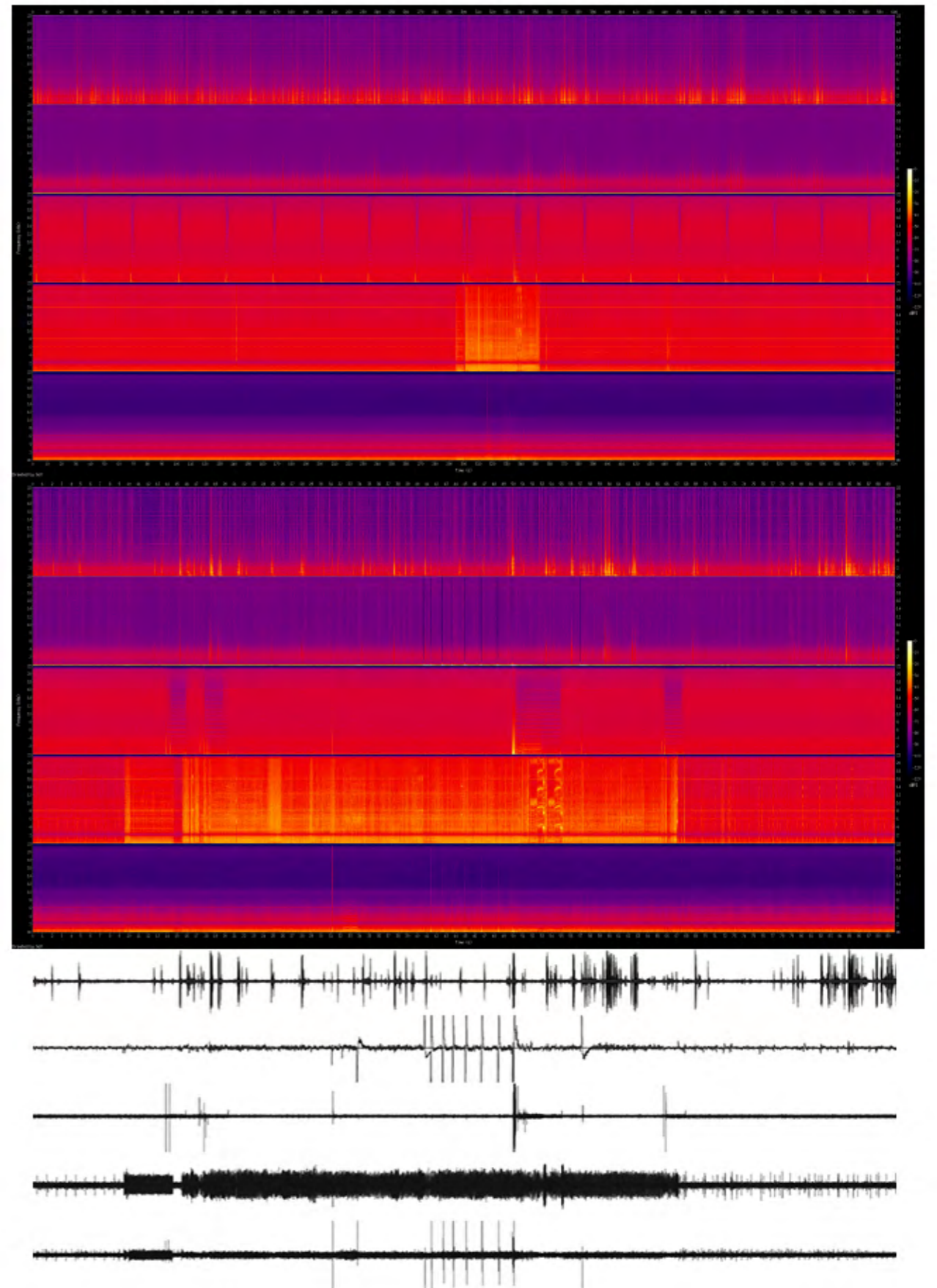
¹ The prototype of the *RemOs1* data platform, part of the larger European project COSYNA (Coastal Observing System for Northern and Arctic Seas), an emerging comprehensive observation system for the elicitation and scientific analysis of the current state as much as a forecast about the development of the coasts of the North and Arctic Seas (www.cosyna.de).



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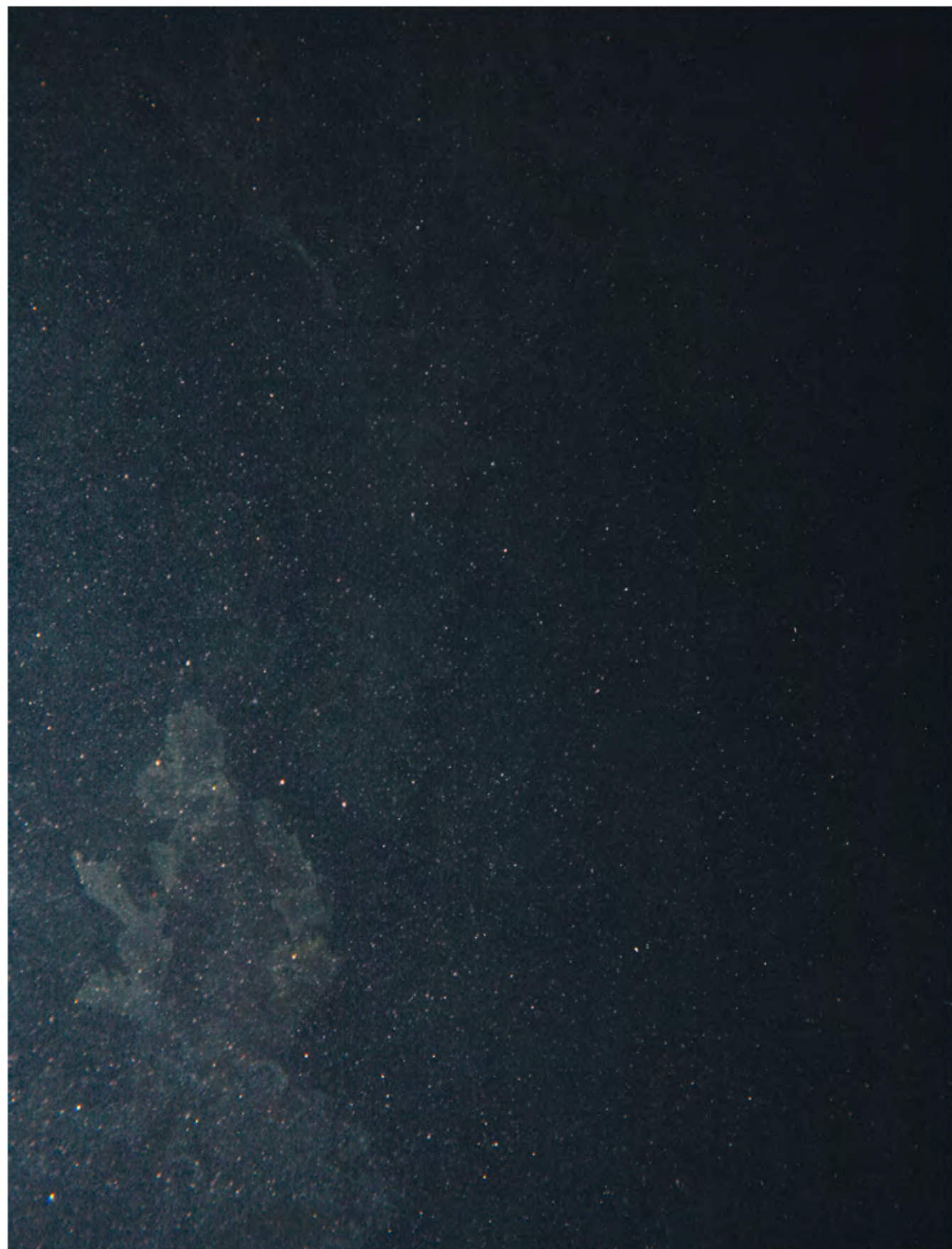


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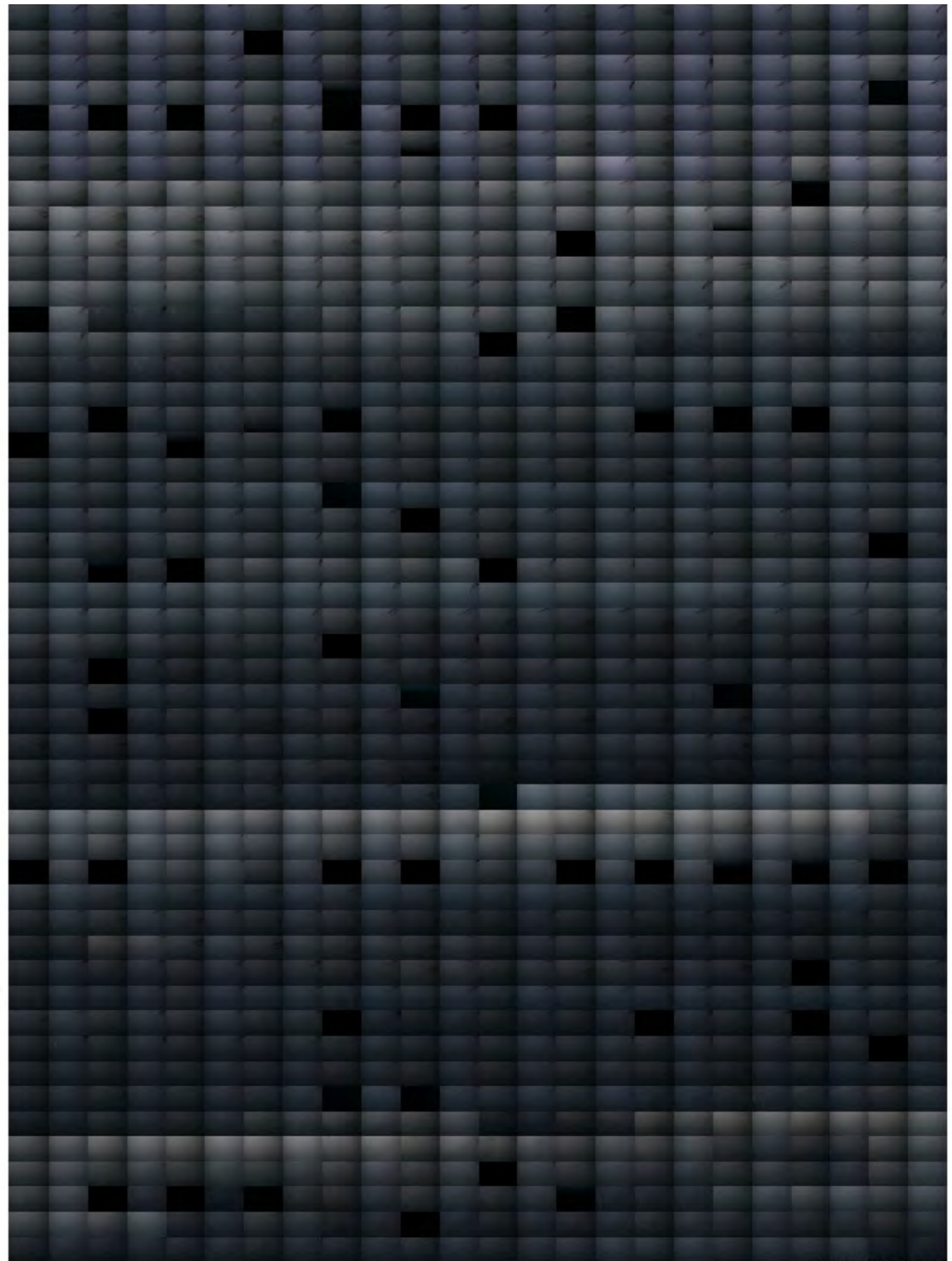
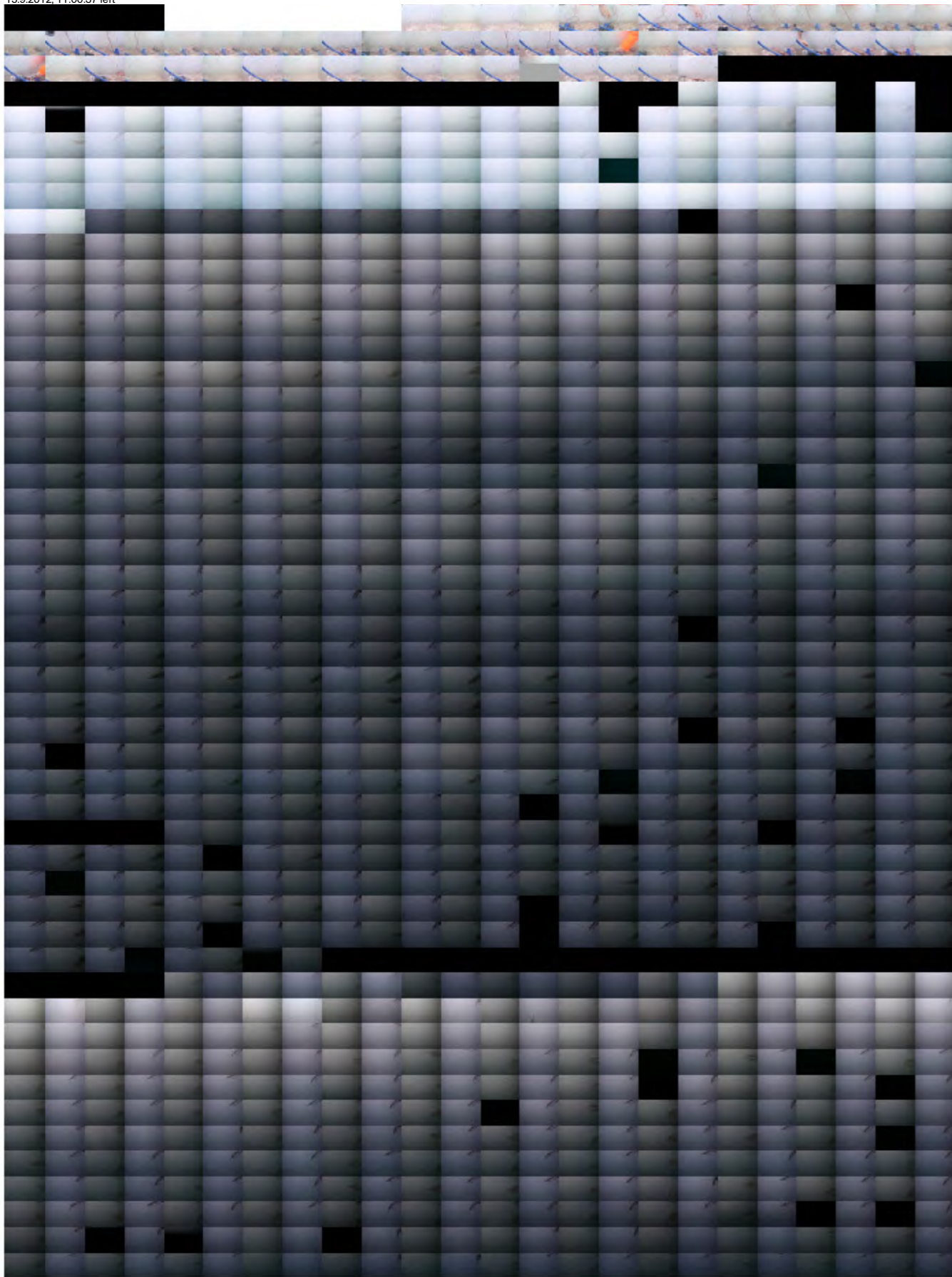


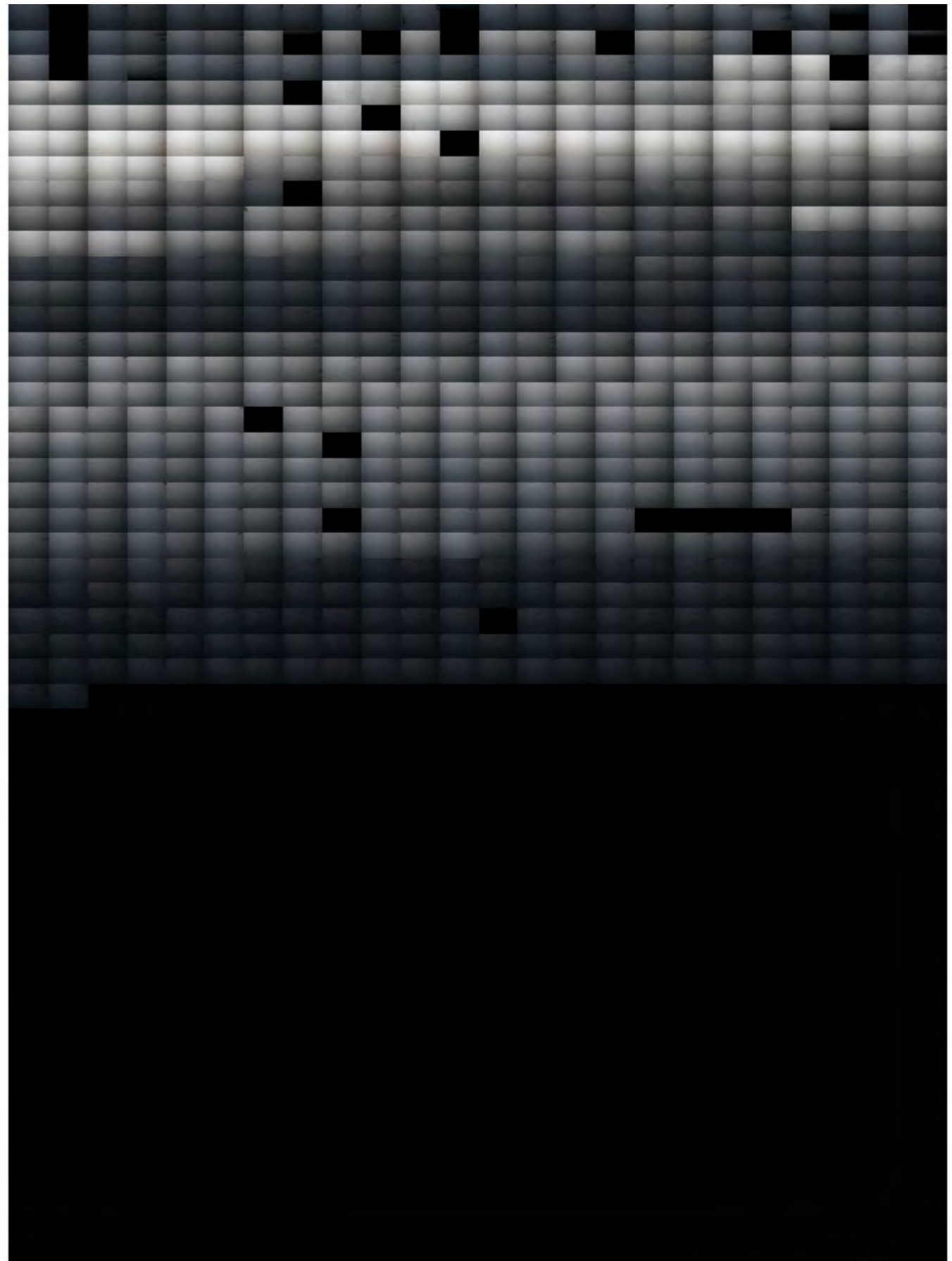
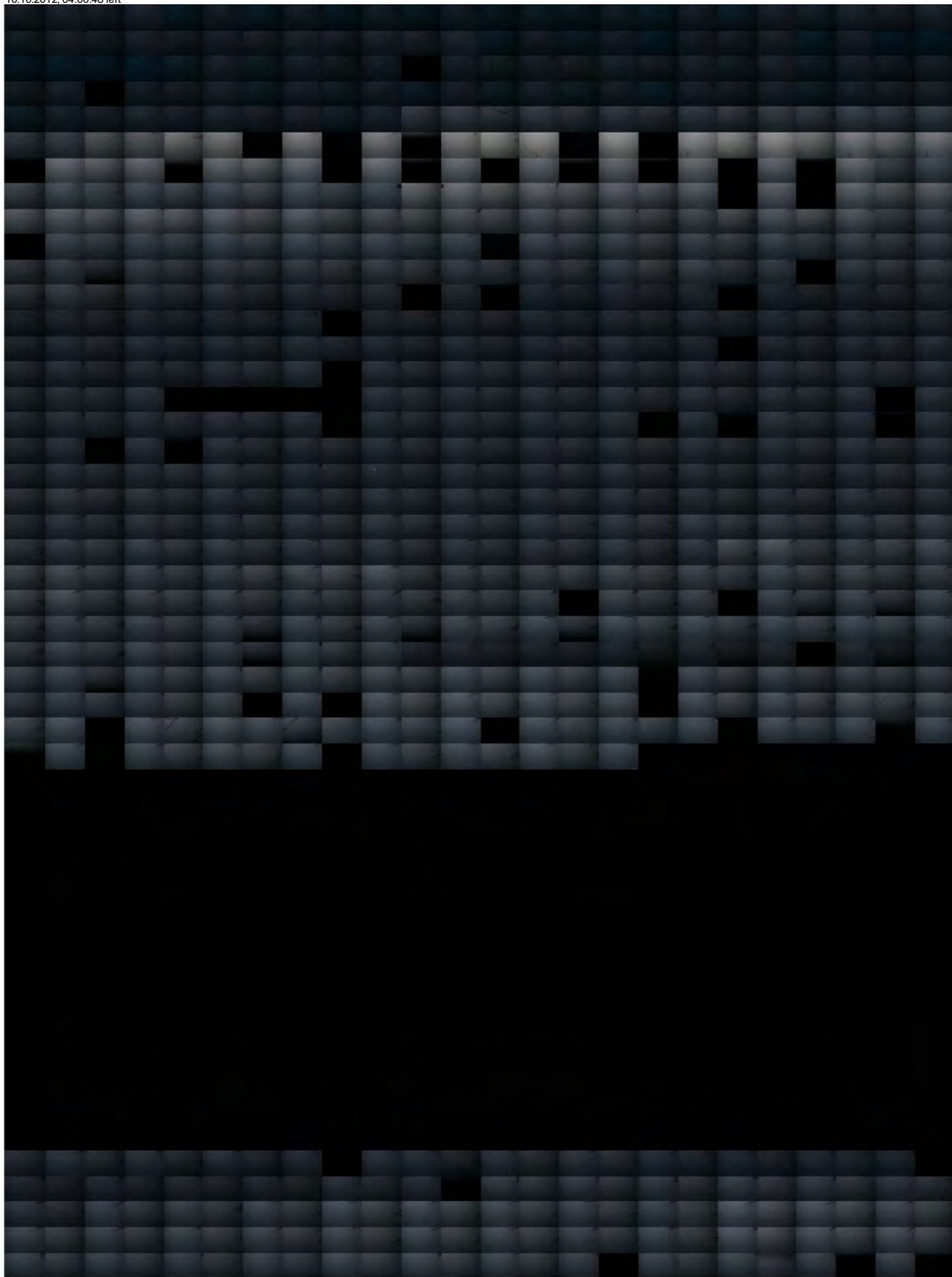


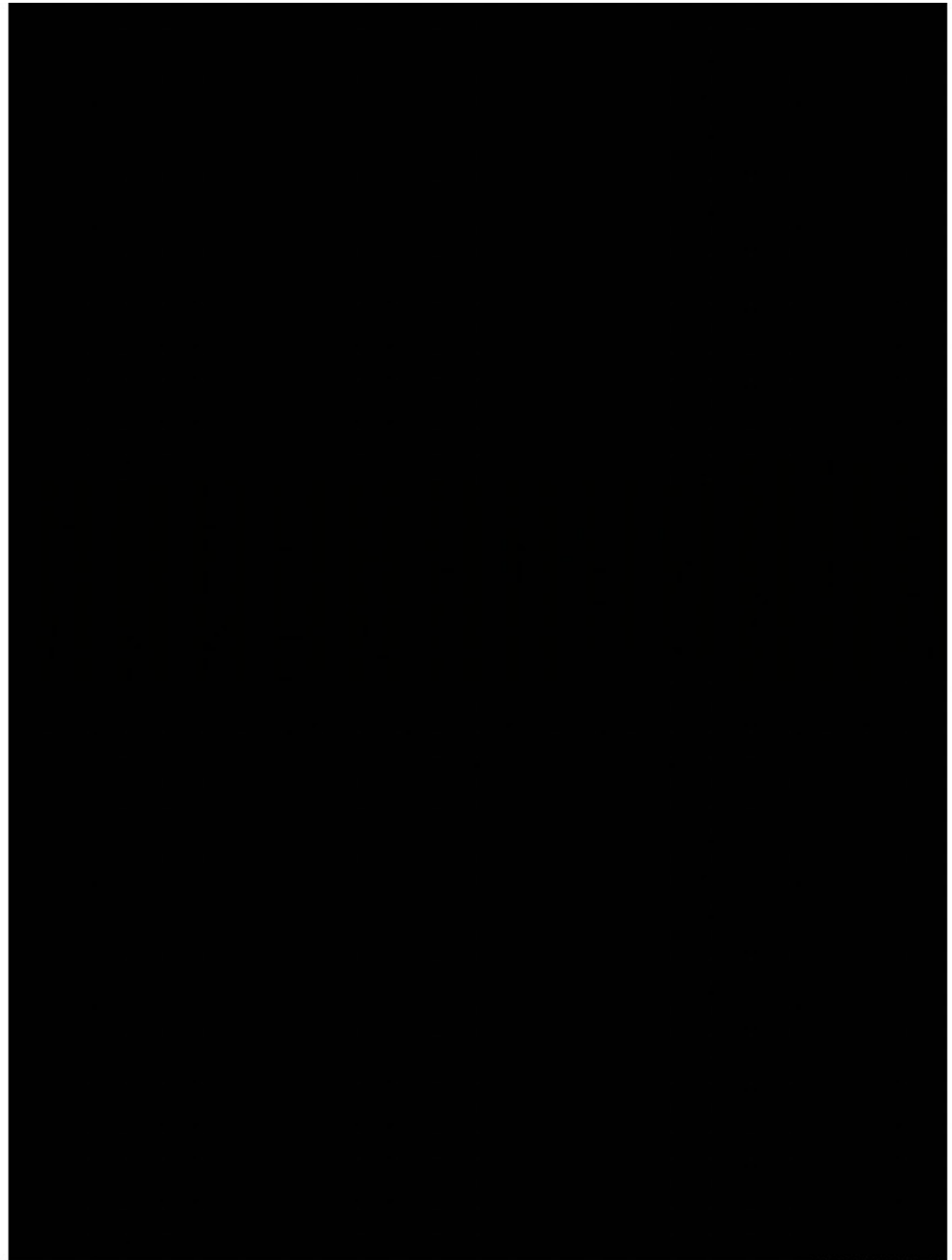
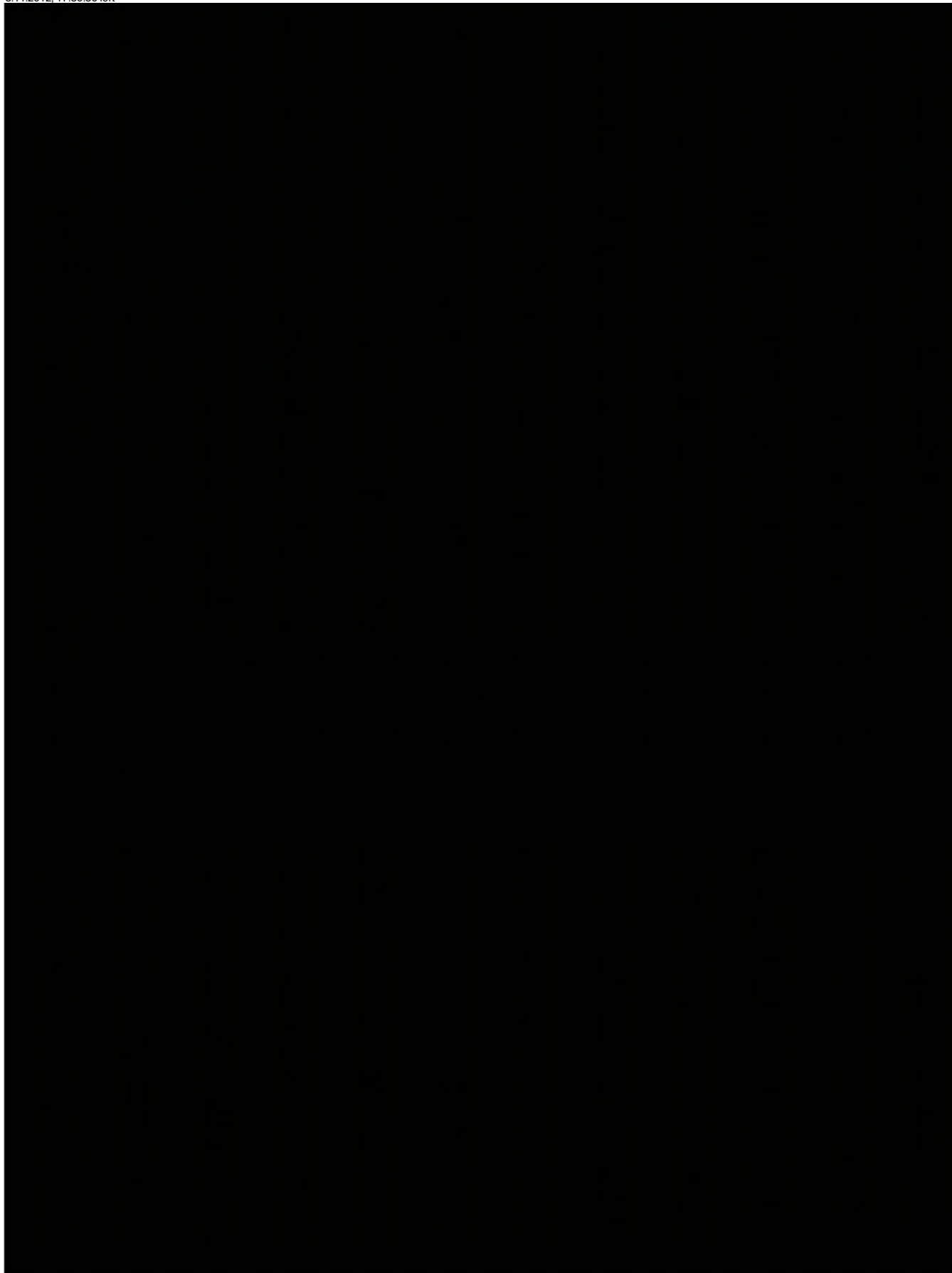
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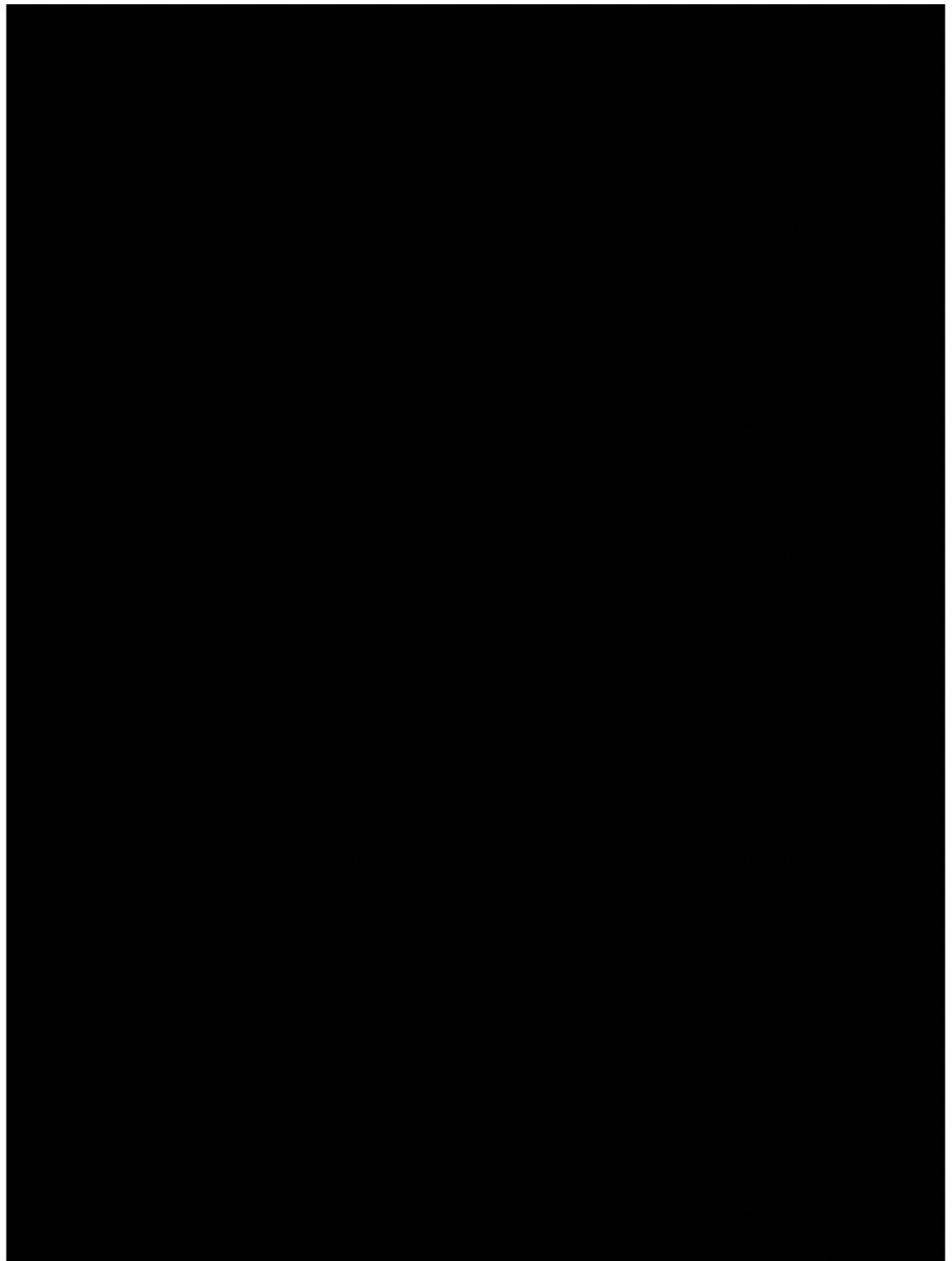


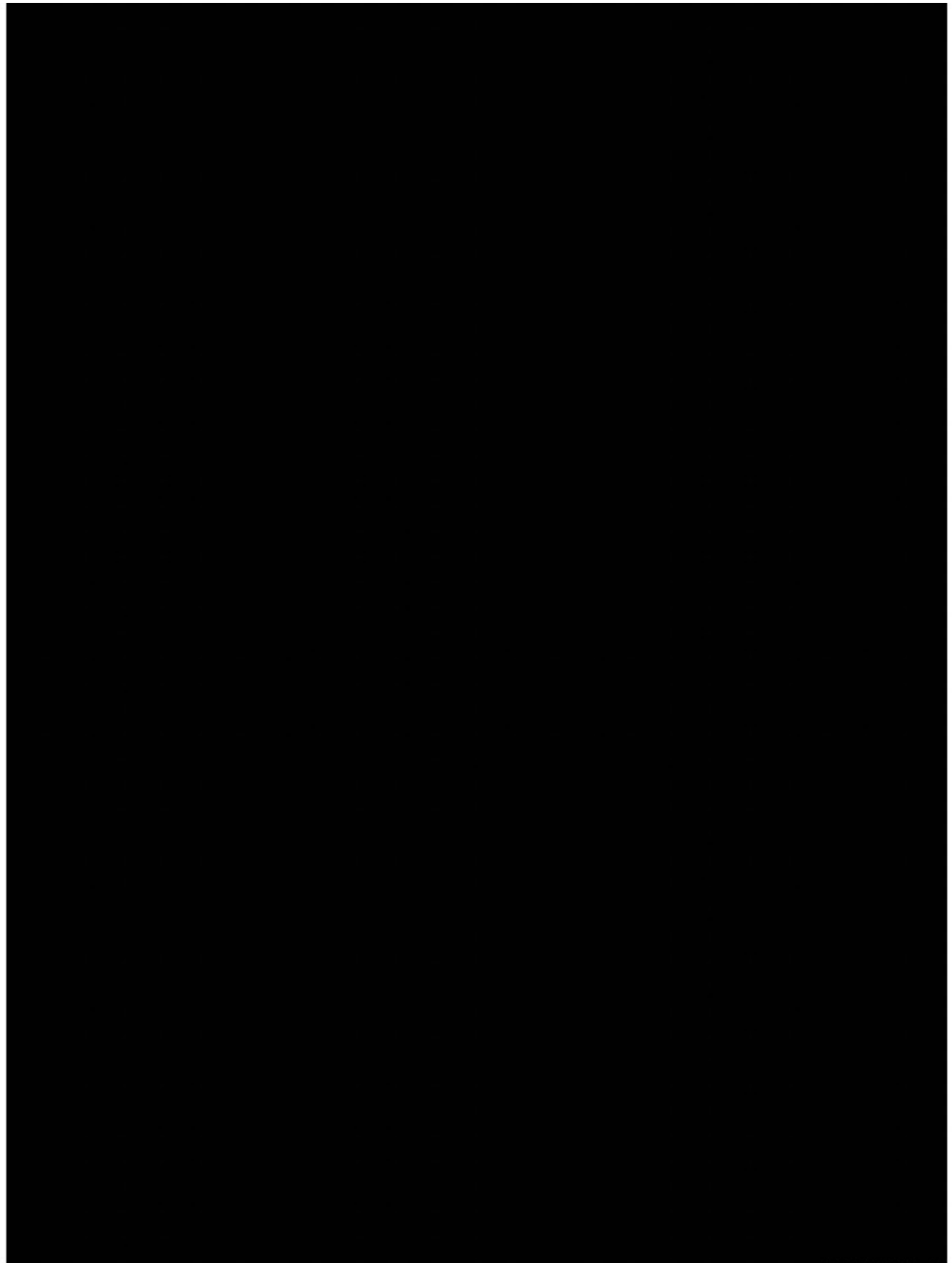
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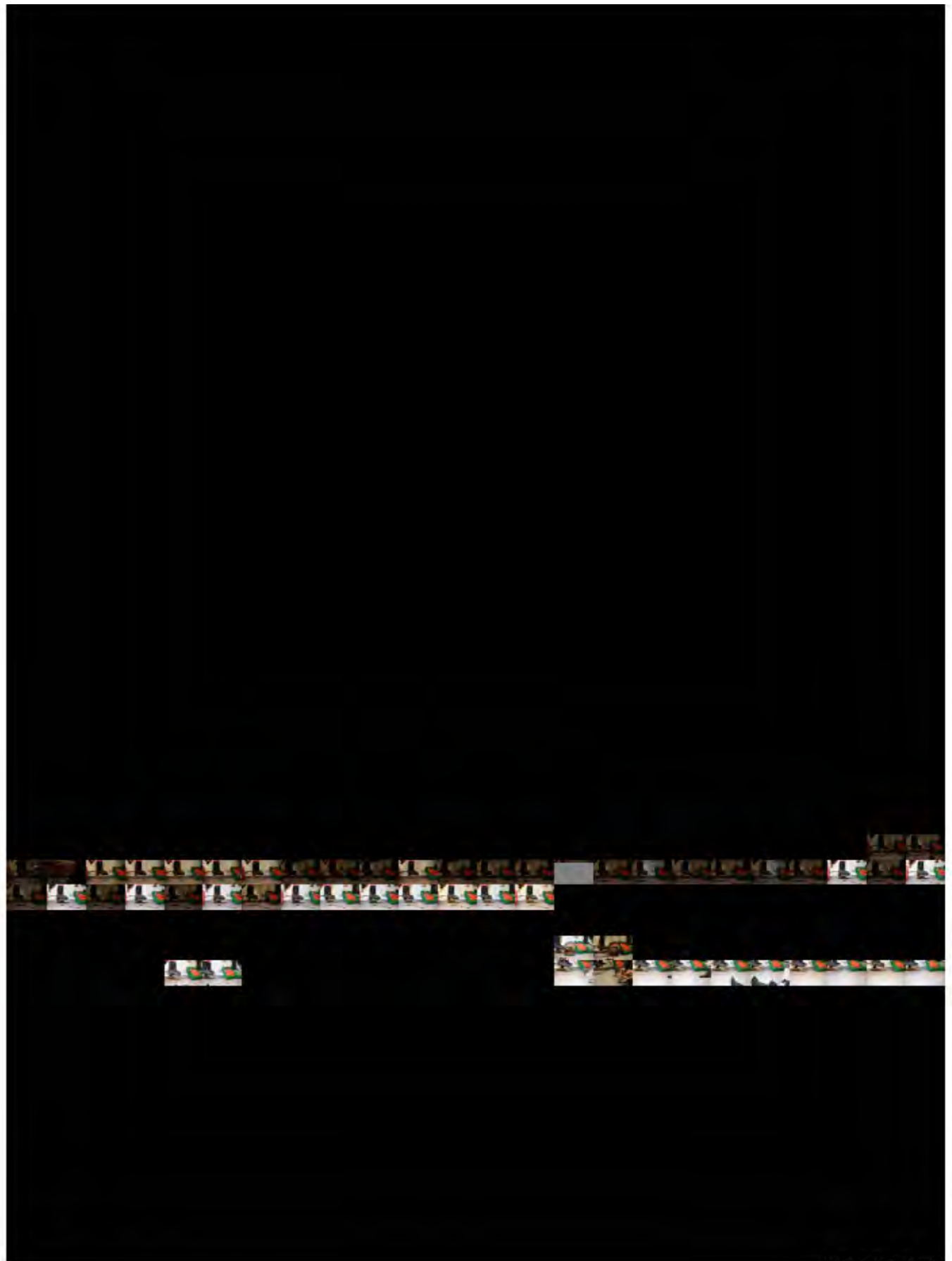


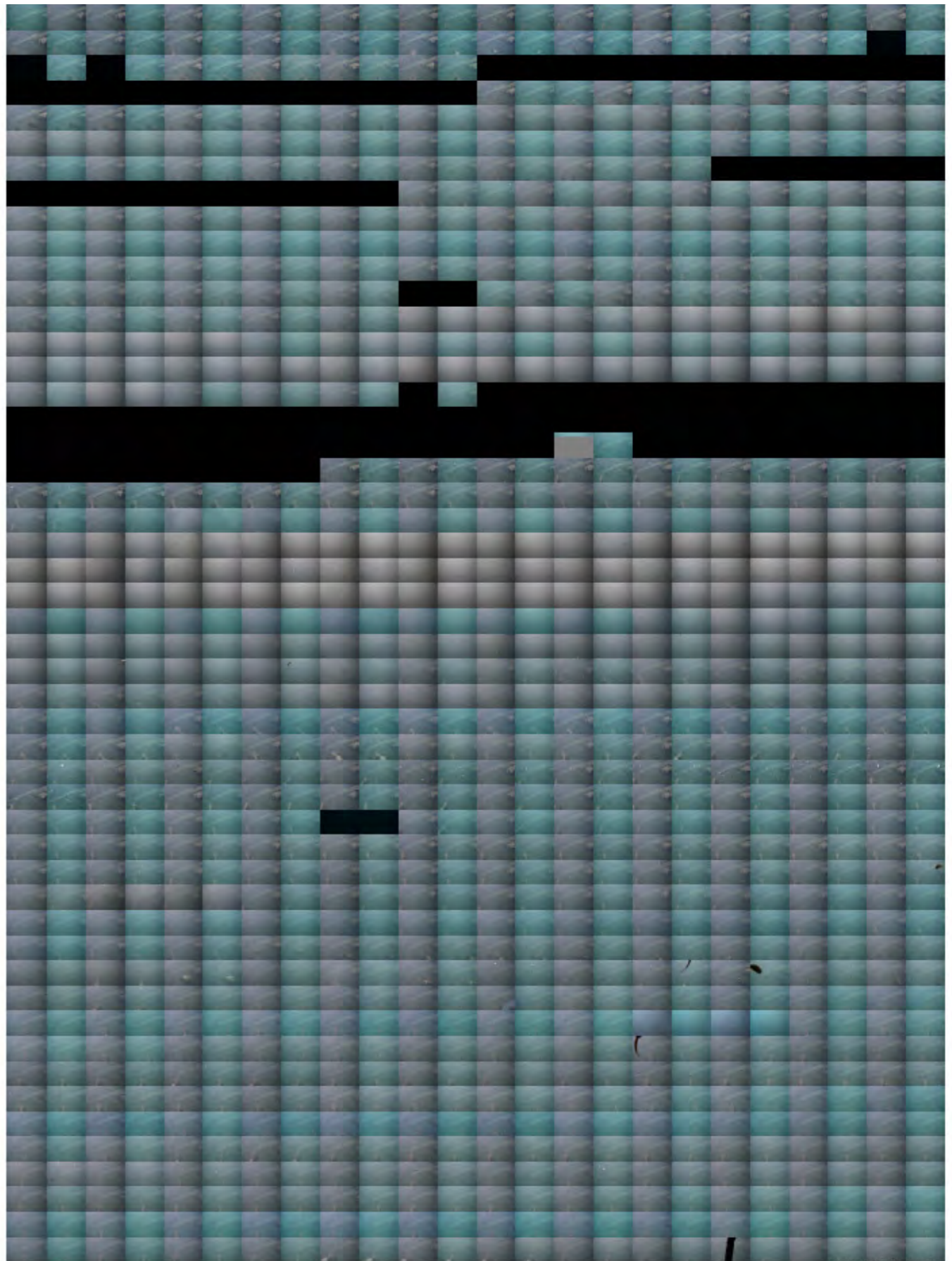
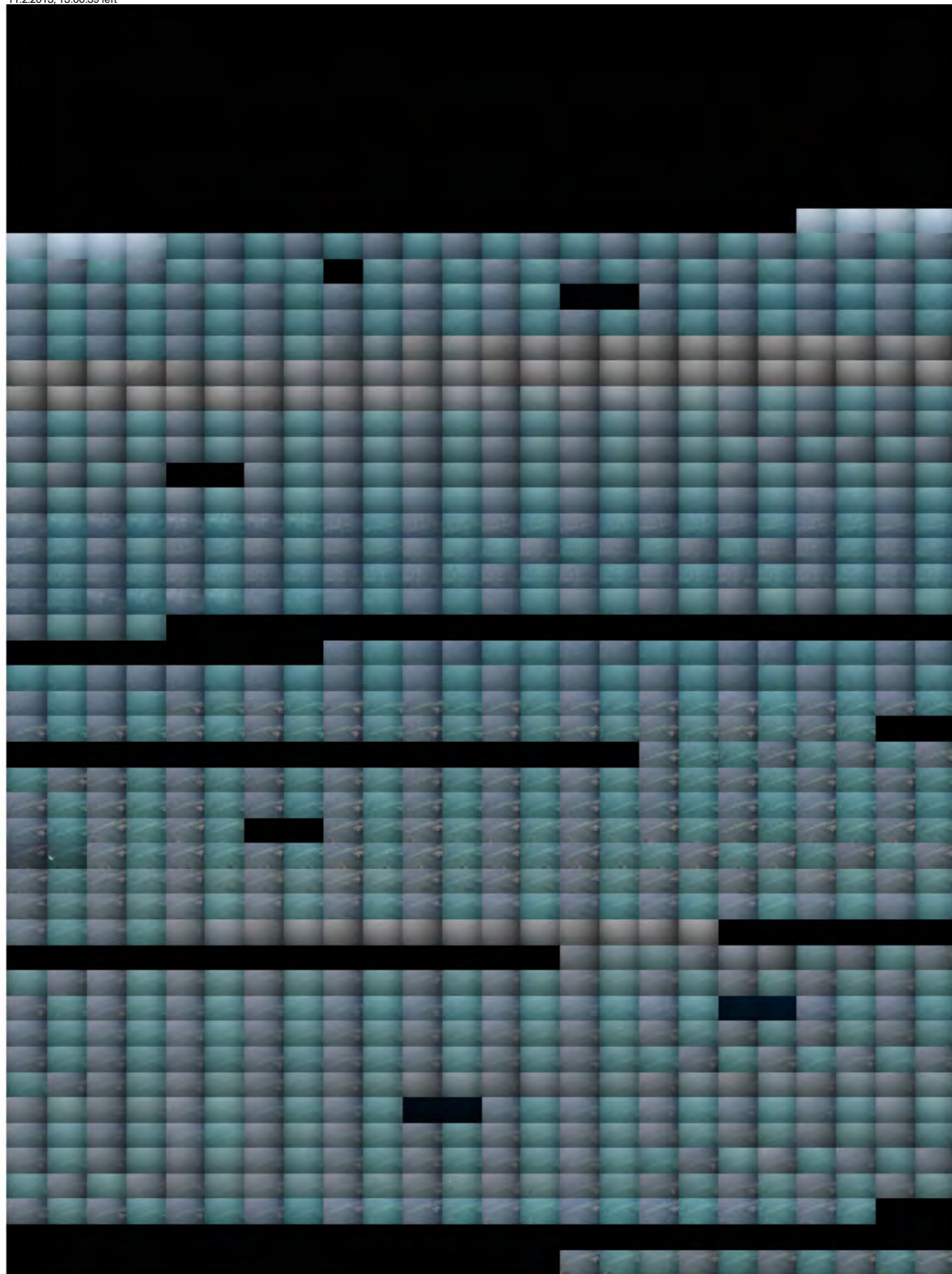


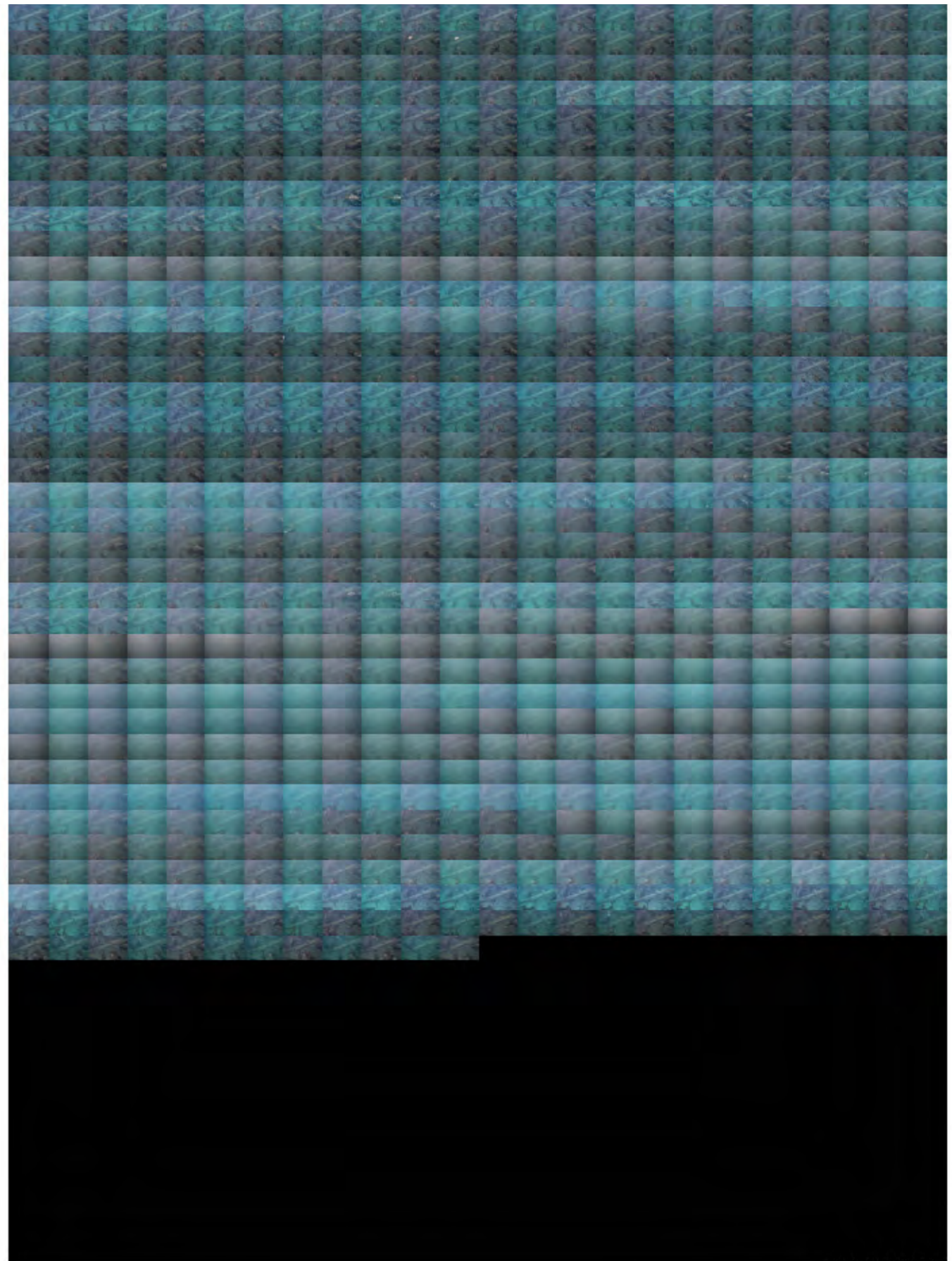
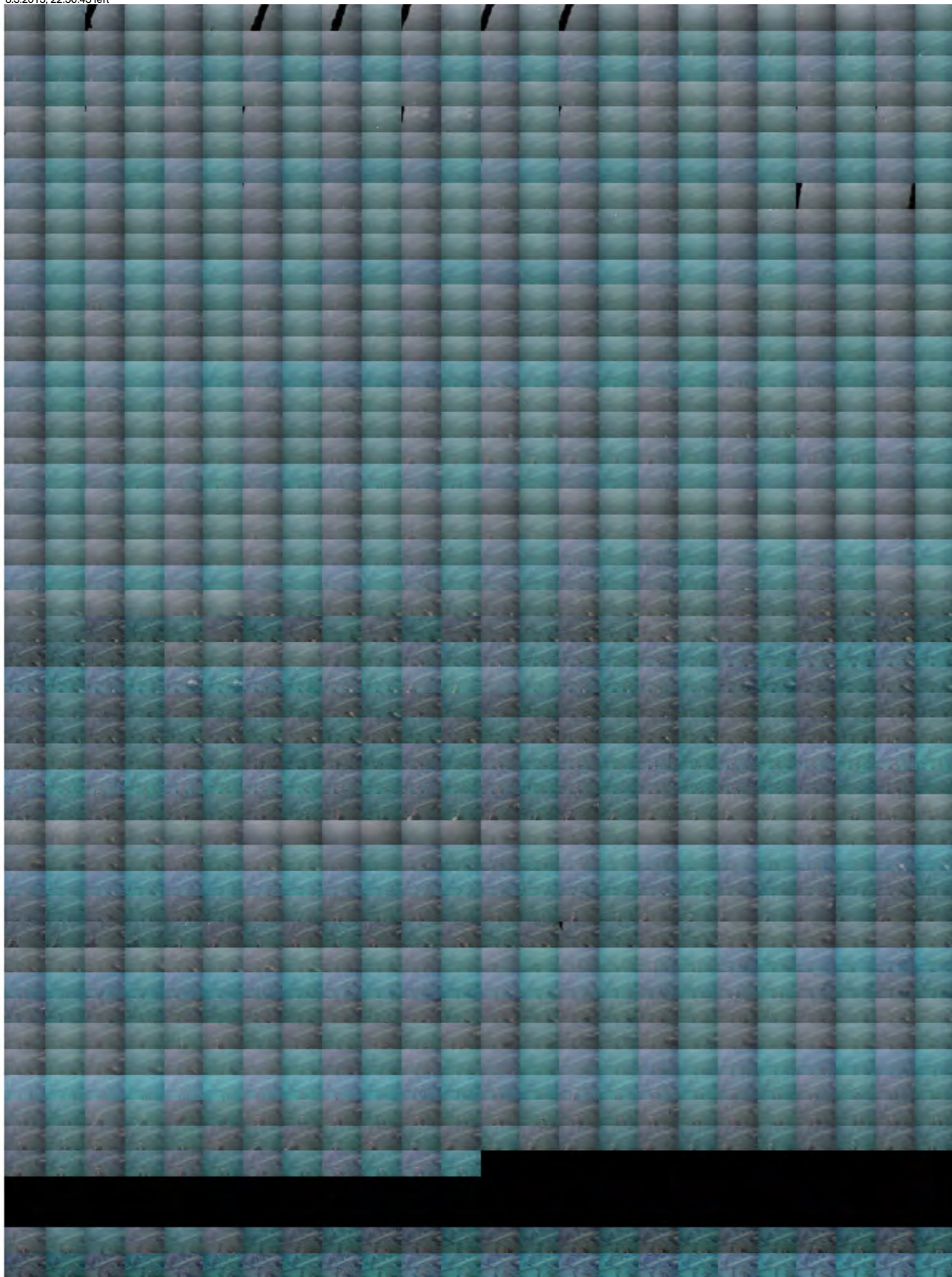


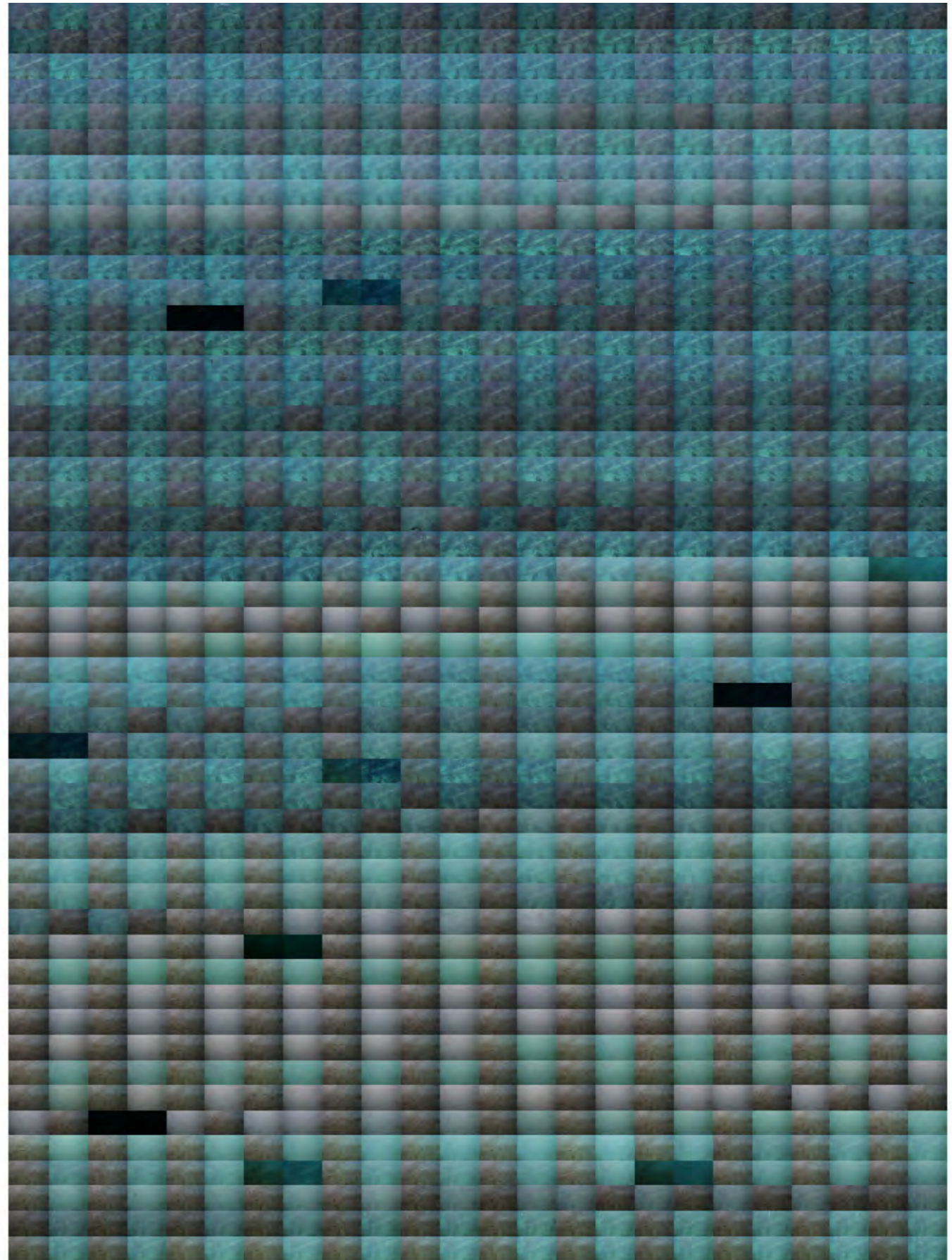
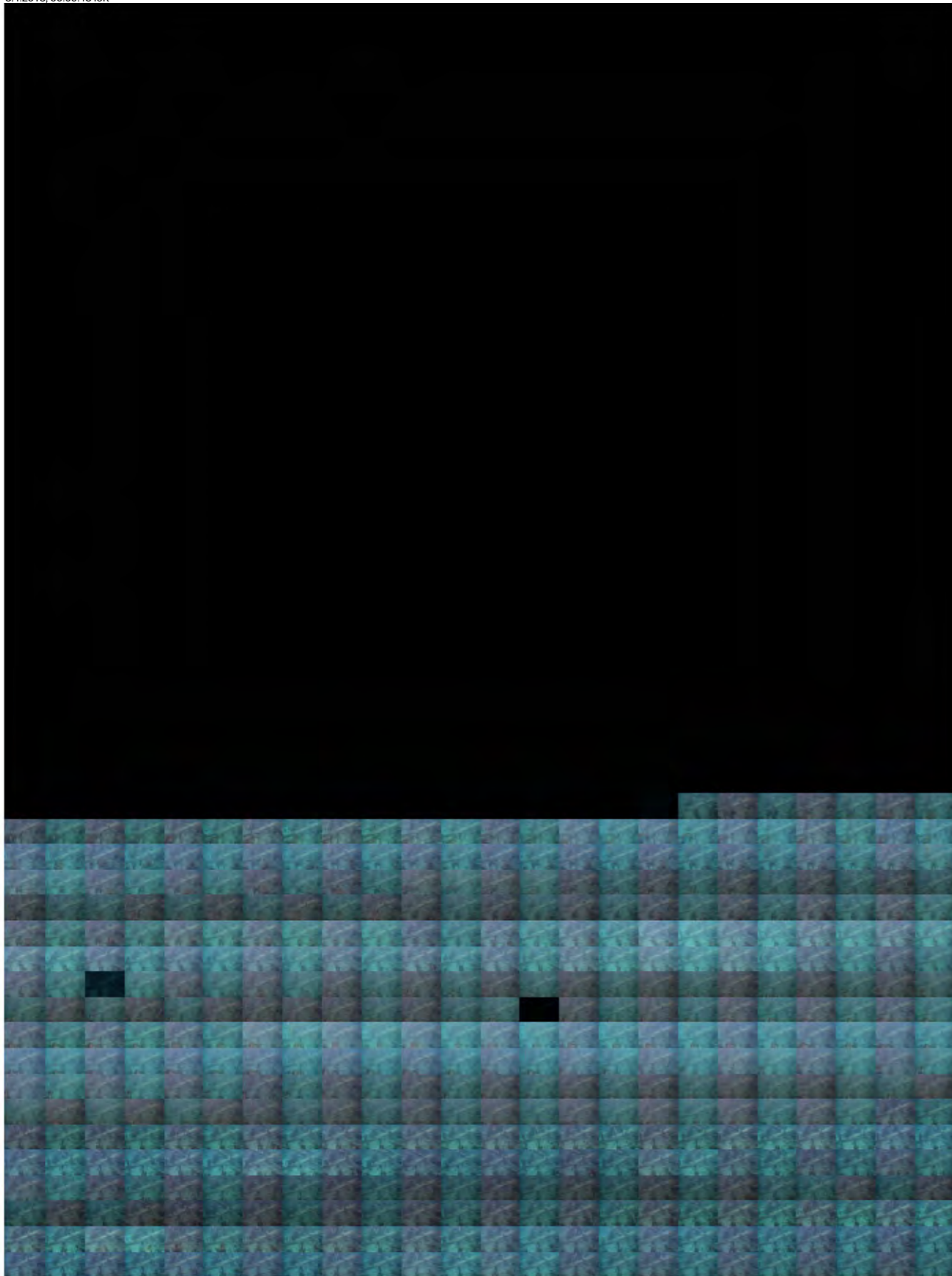




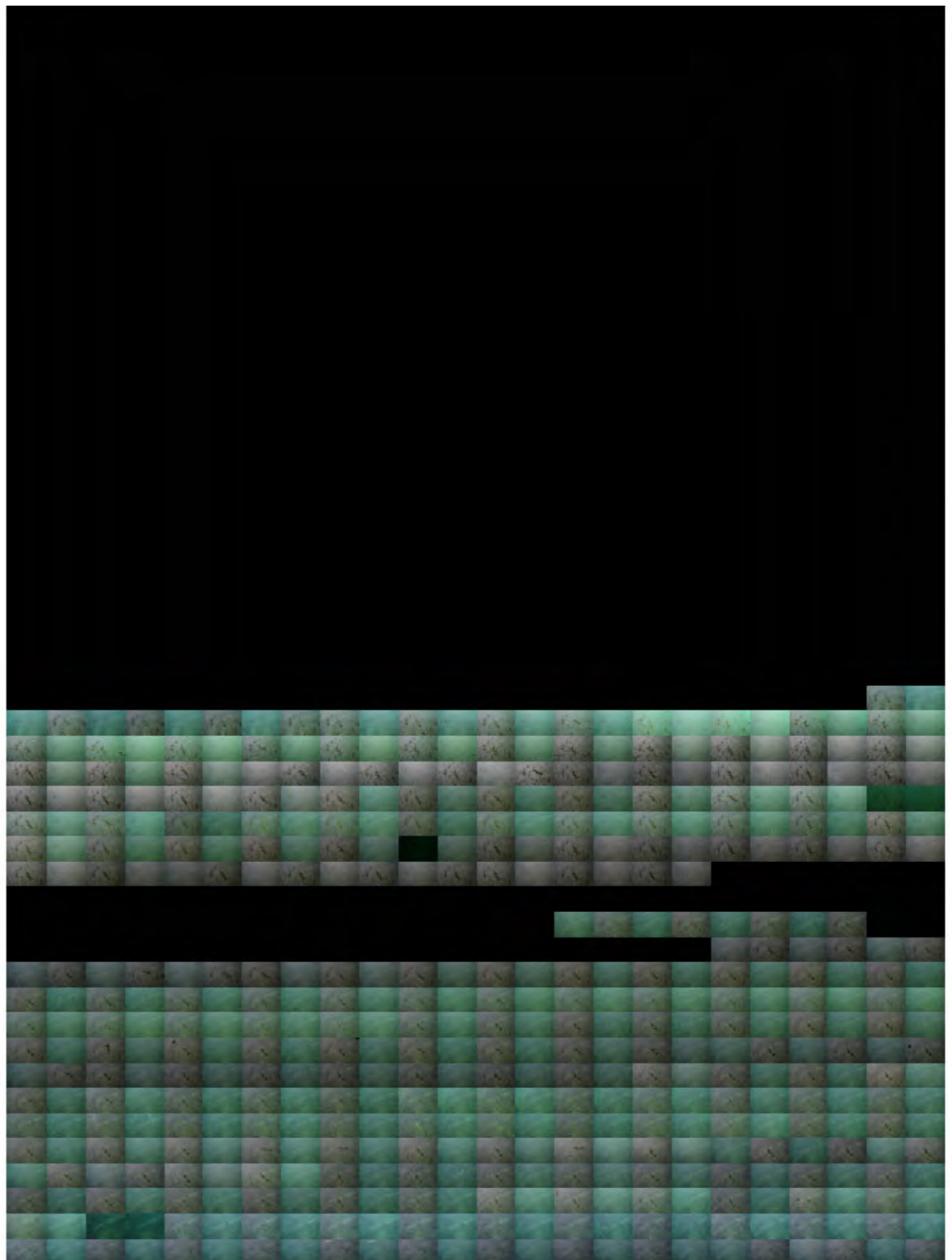
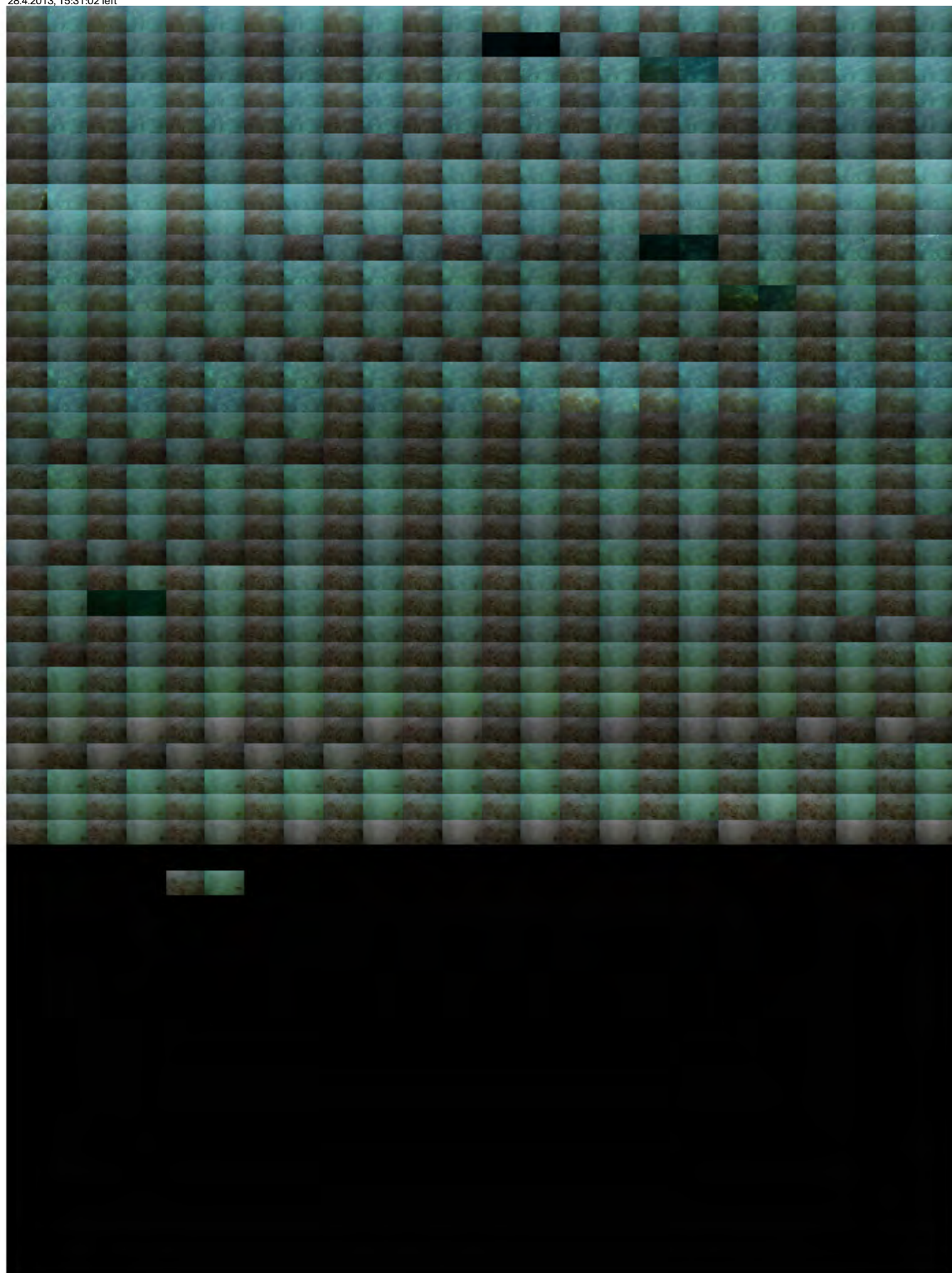




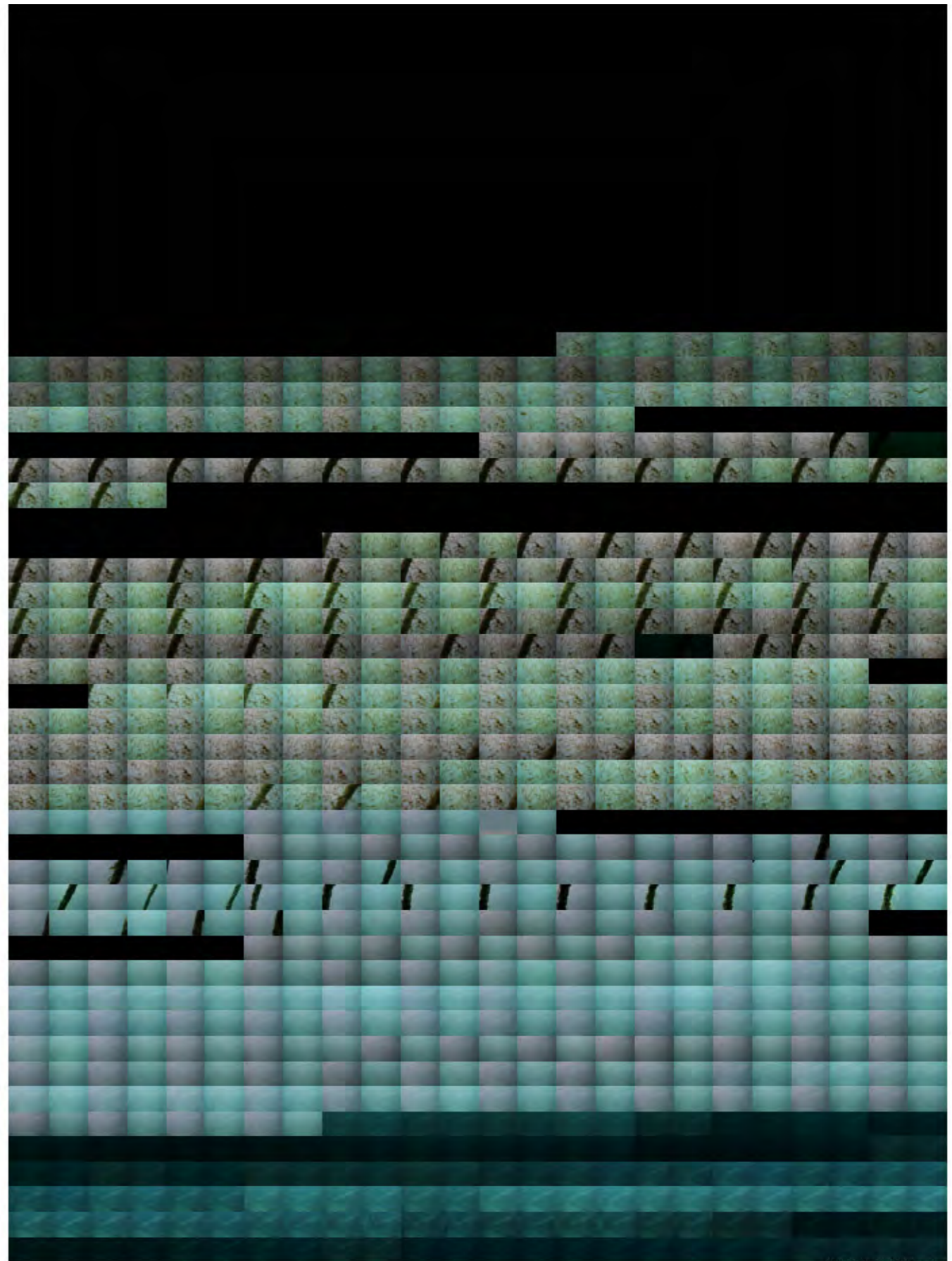
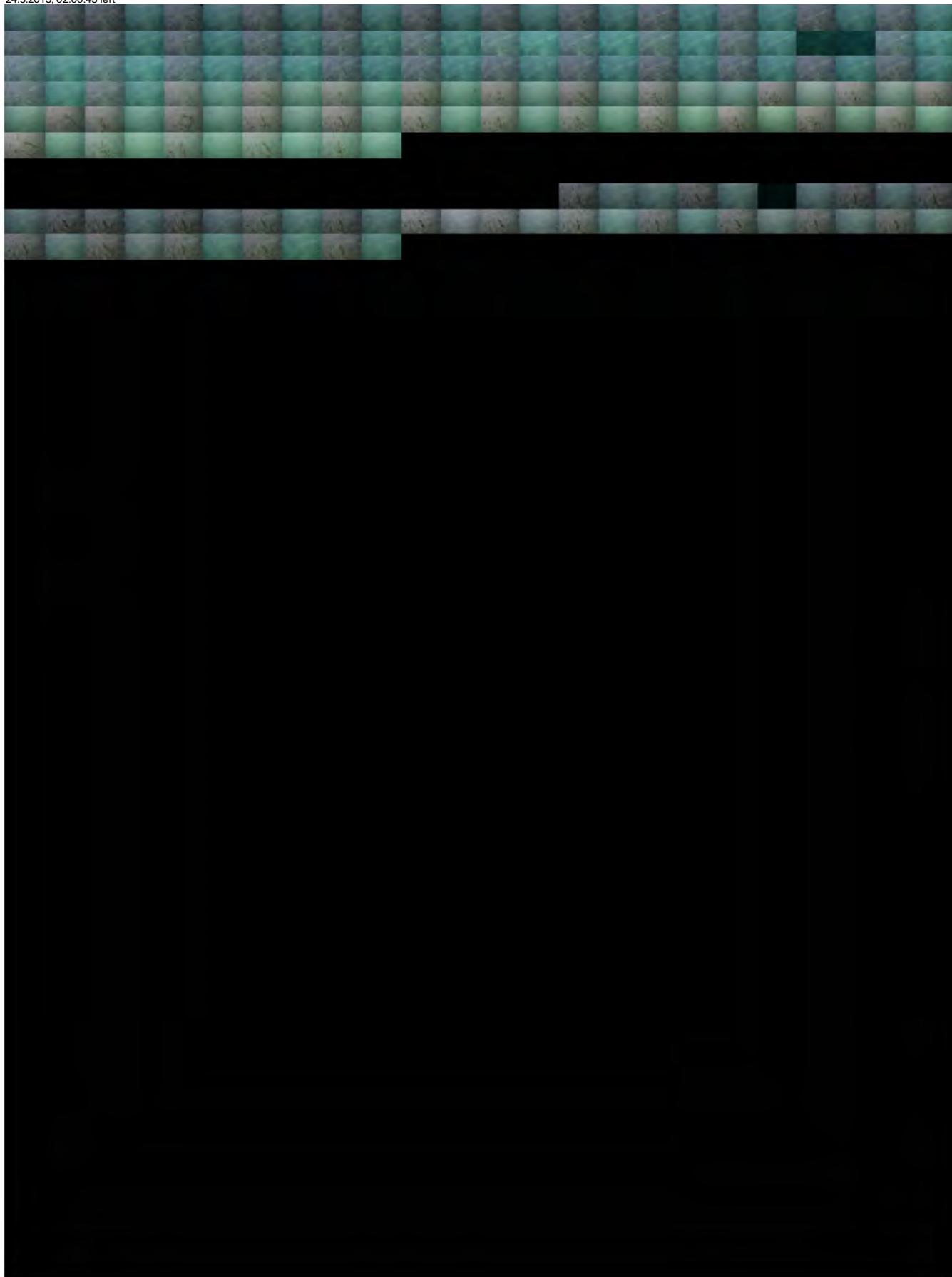




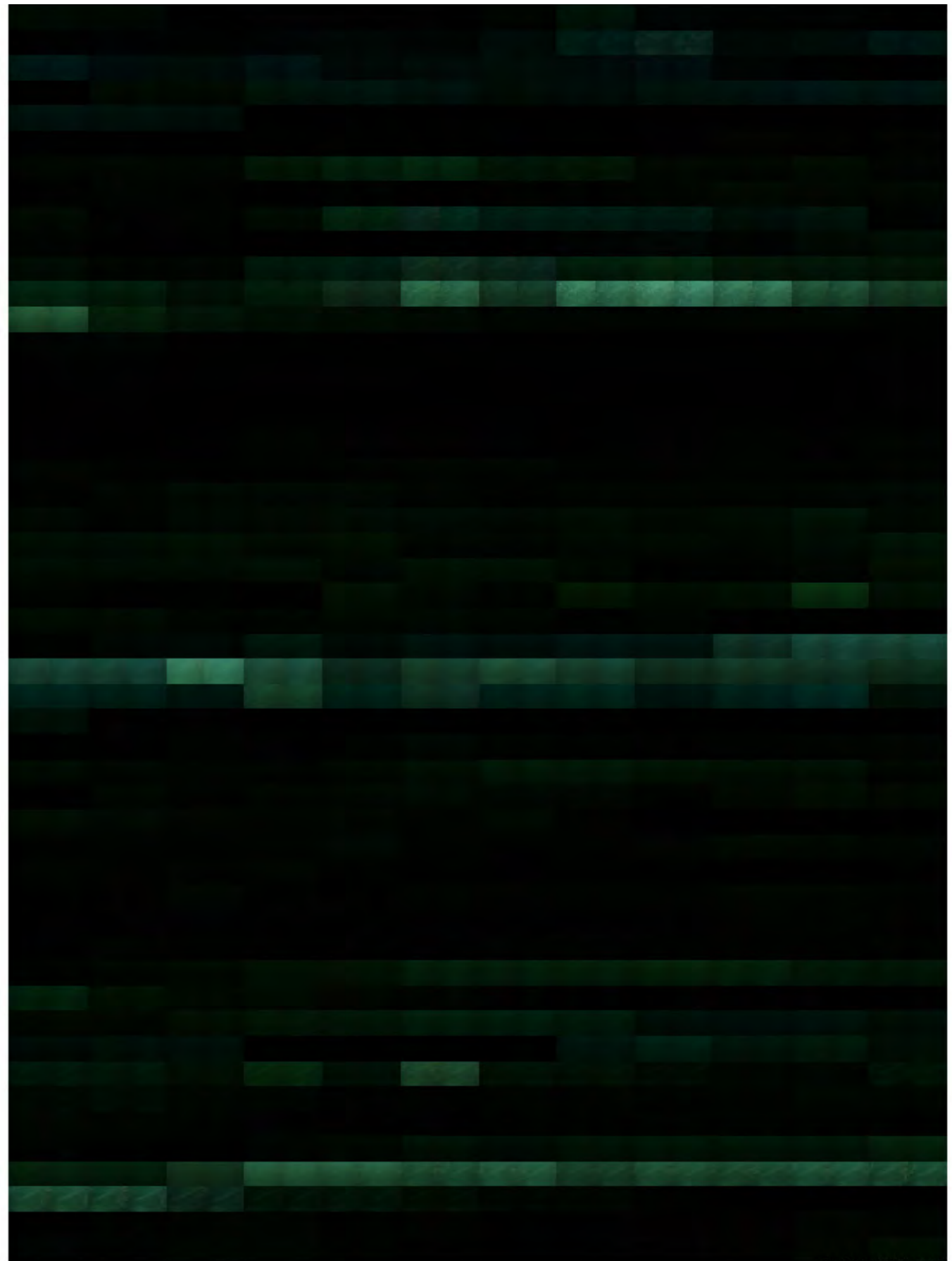
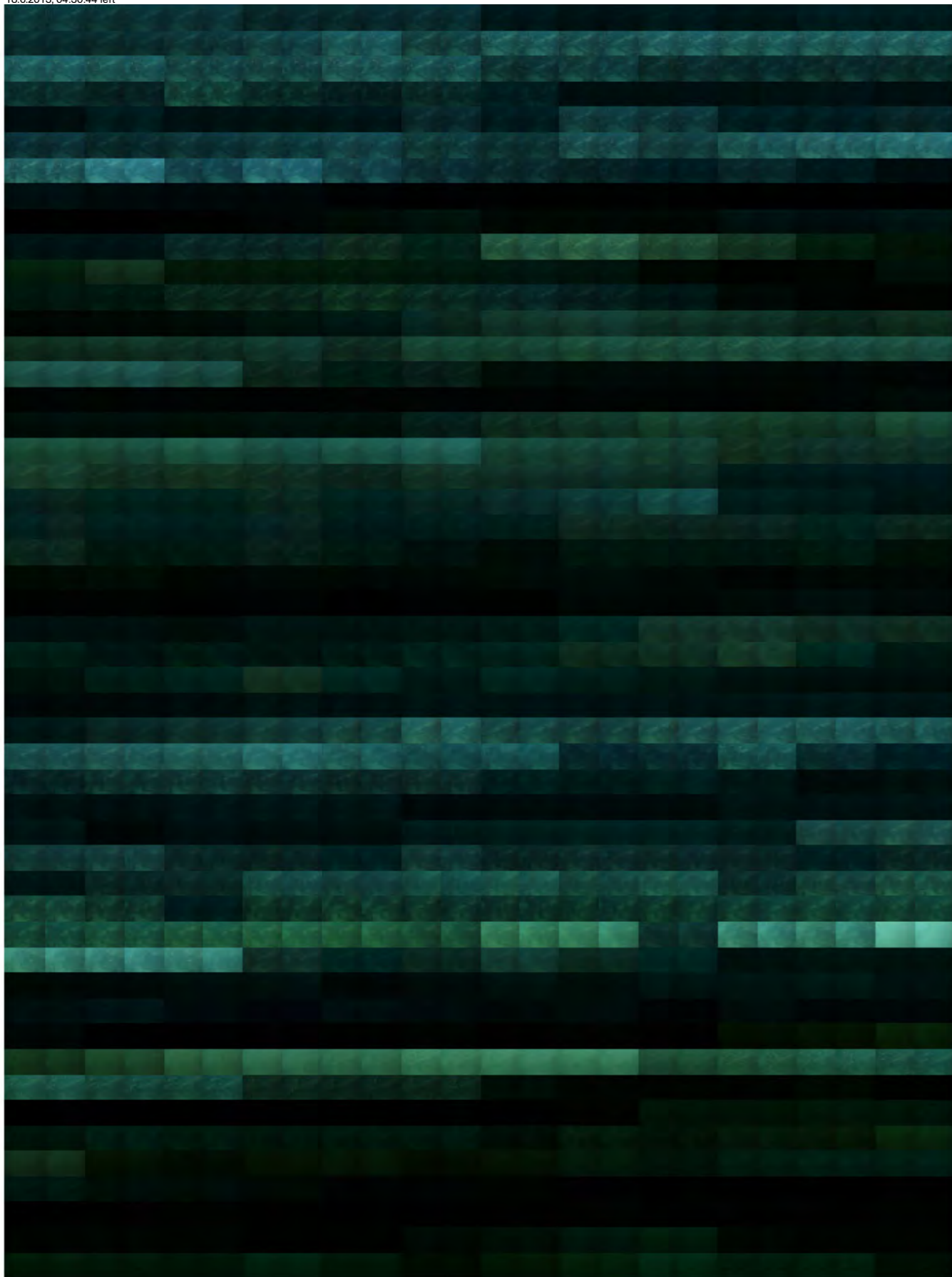
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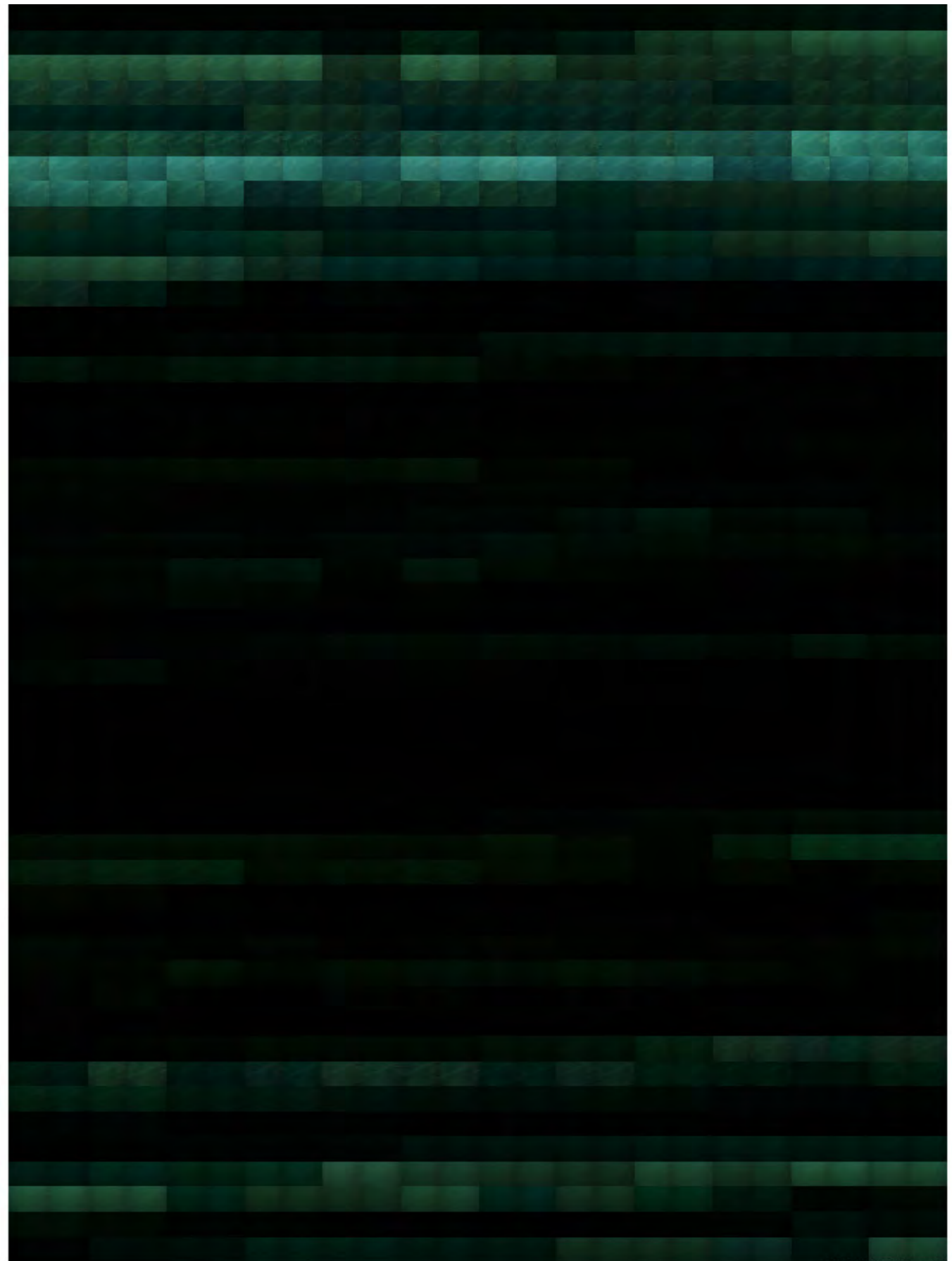


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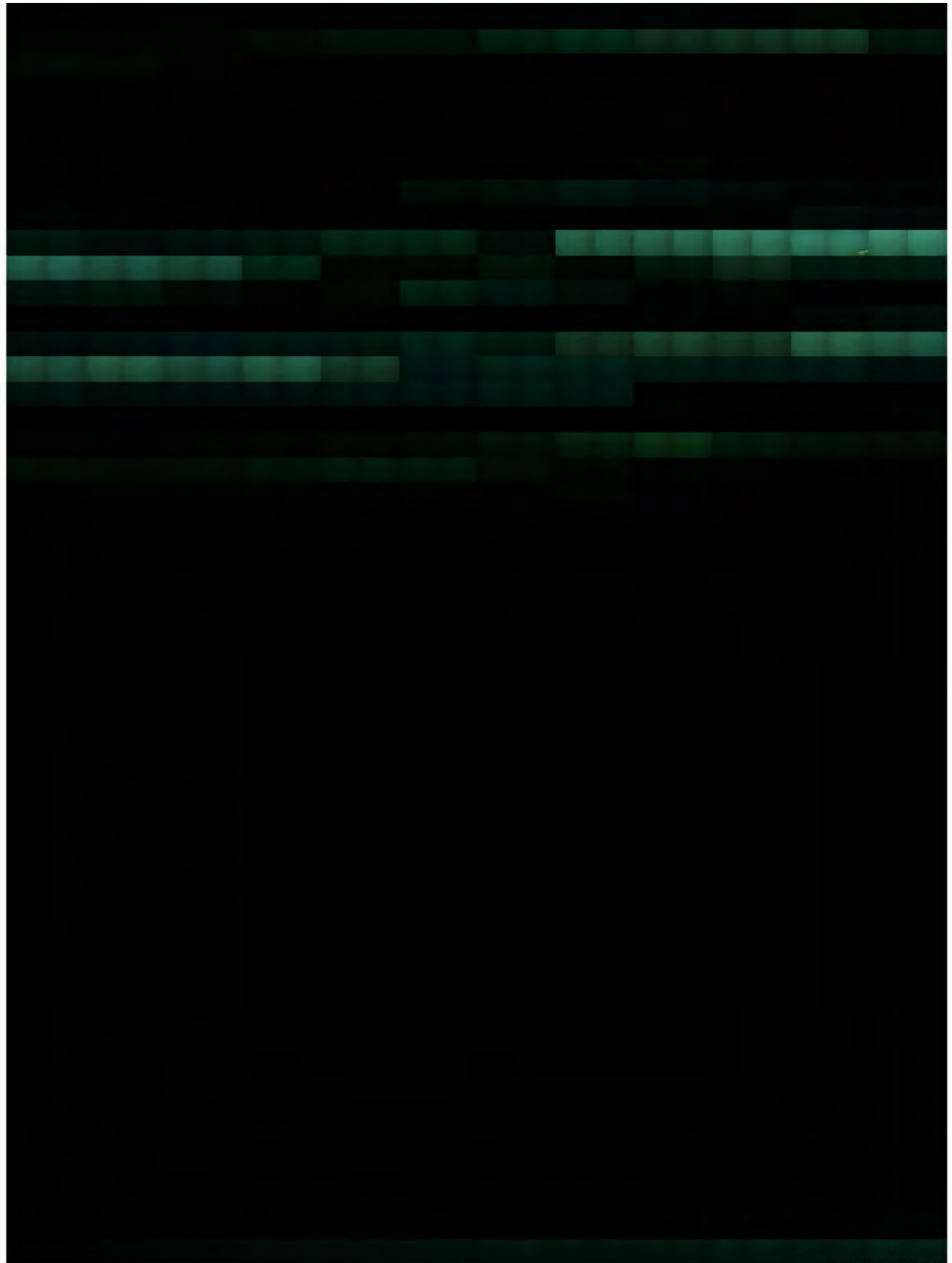


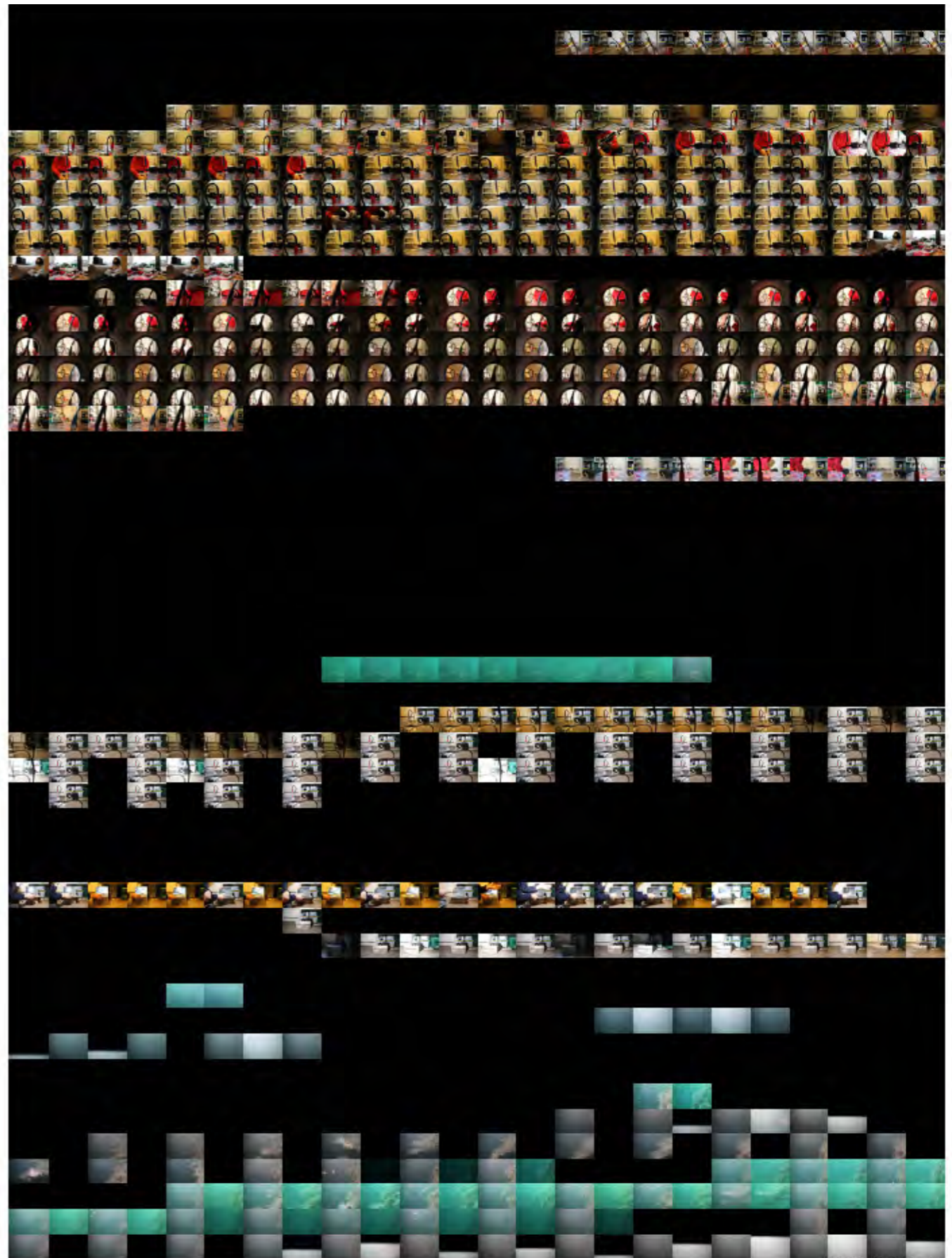
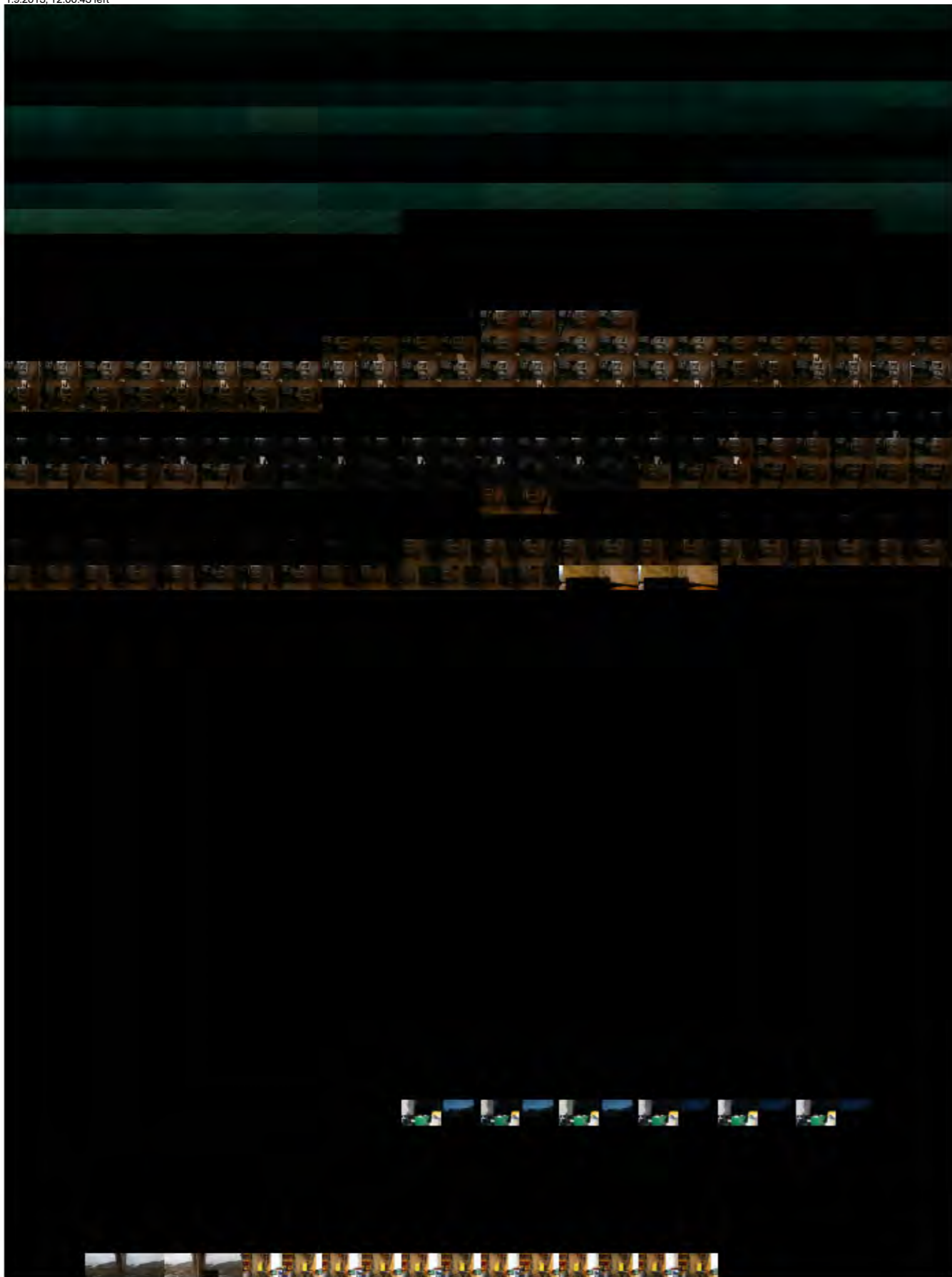
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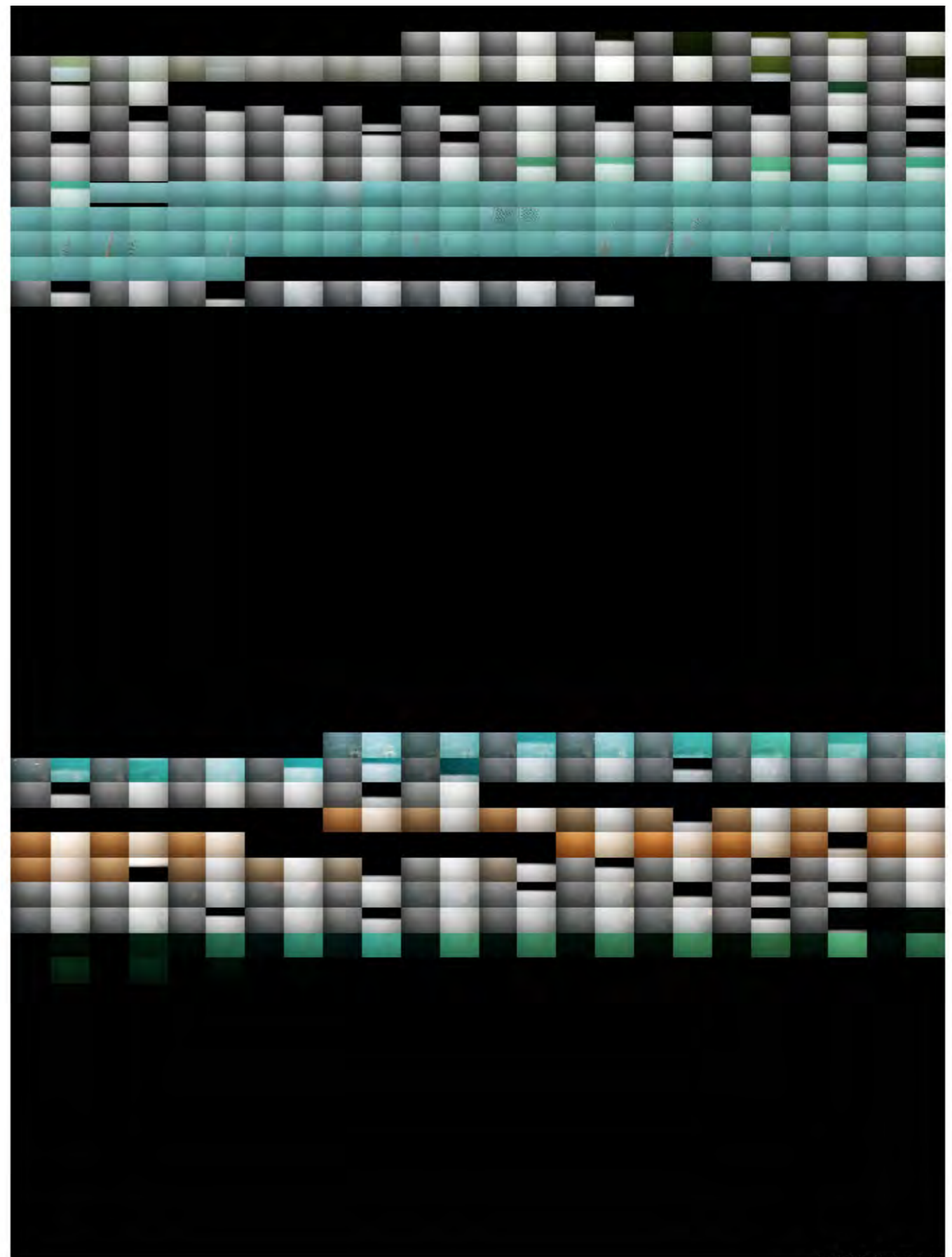
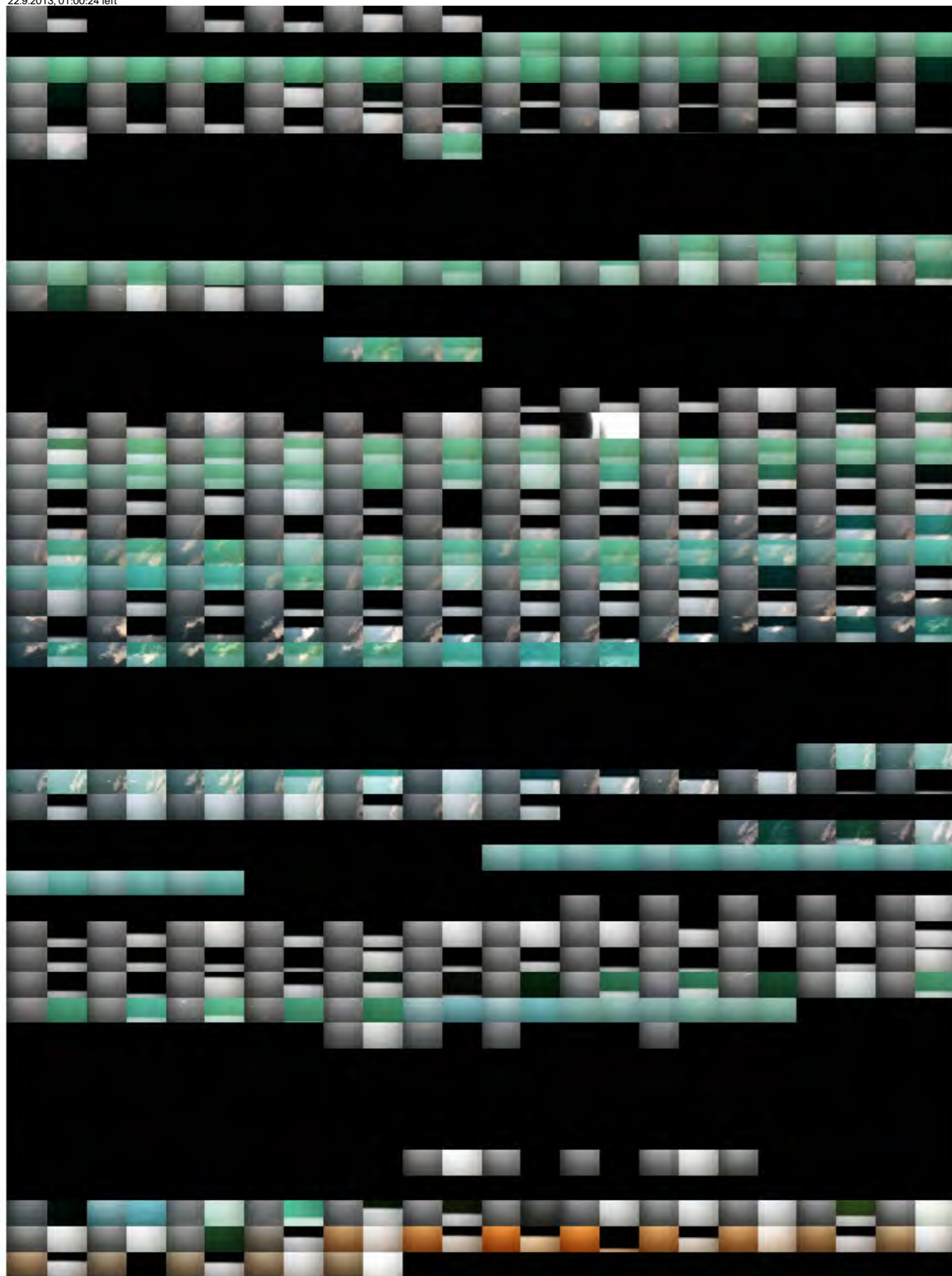
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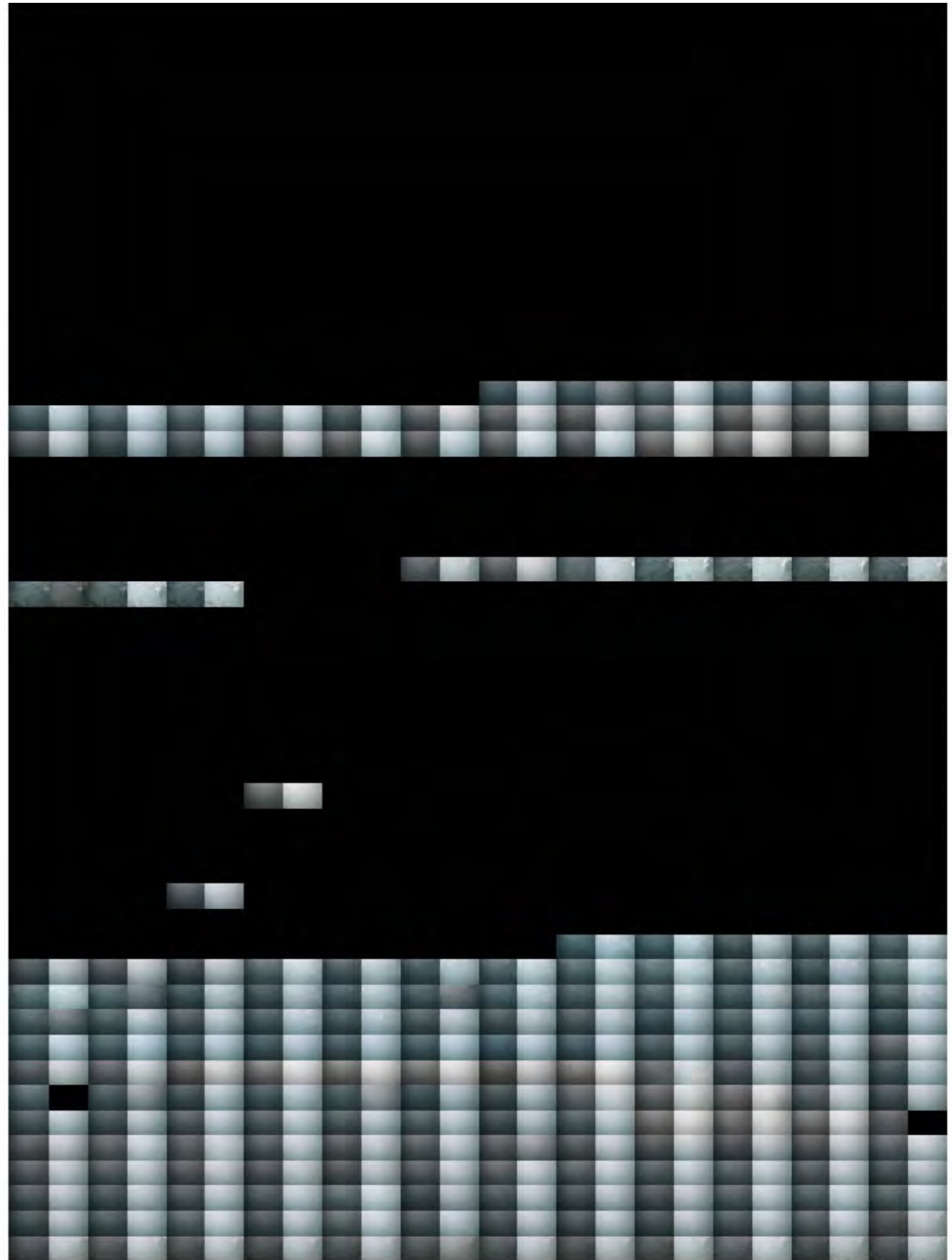
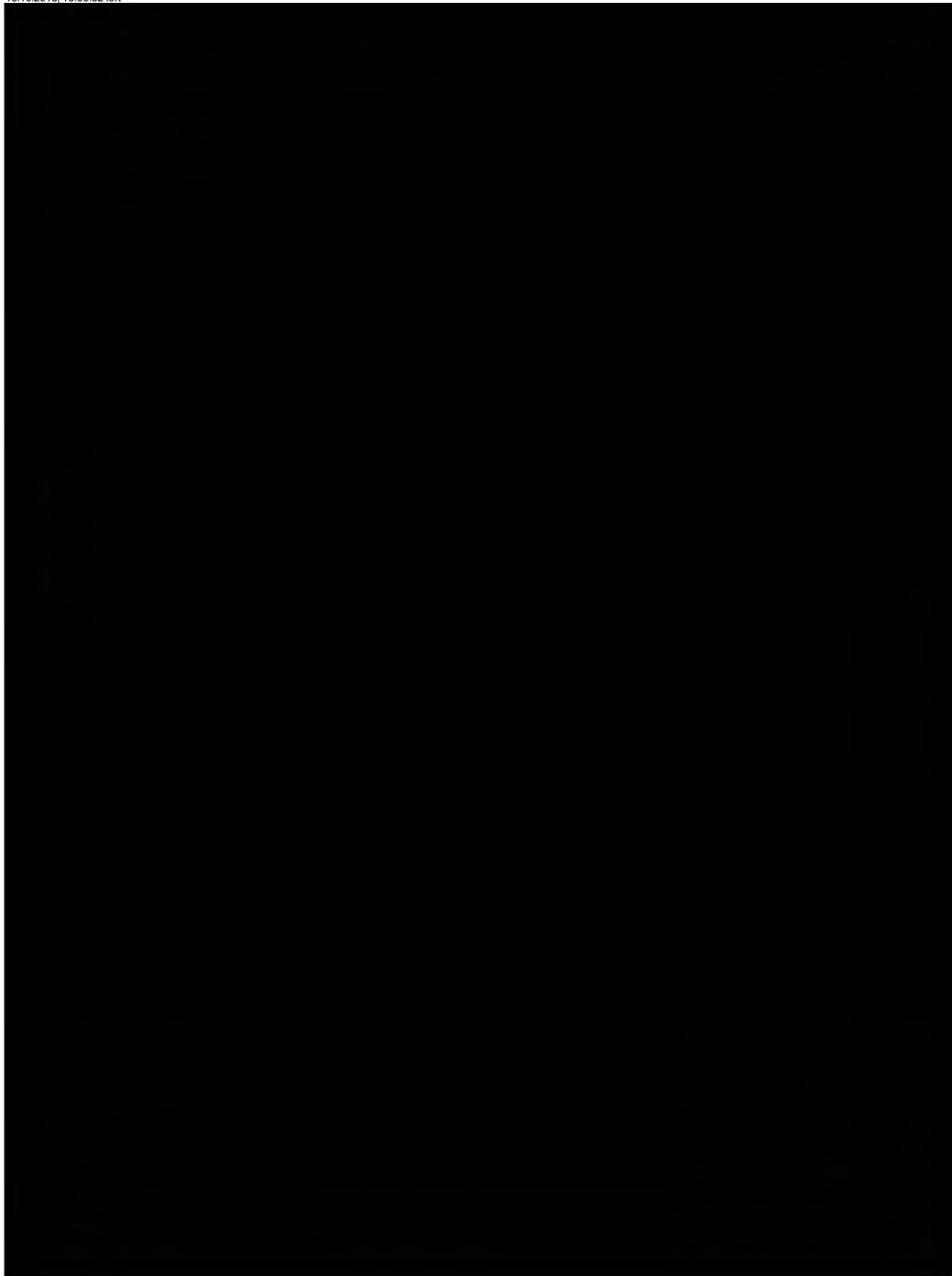


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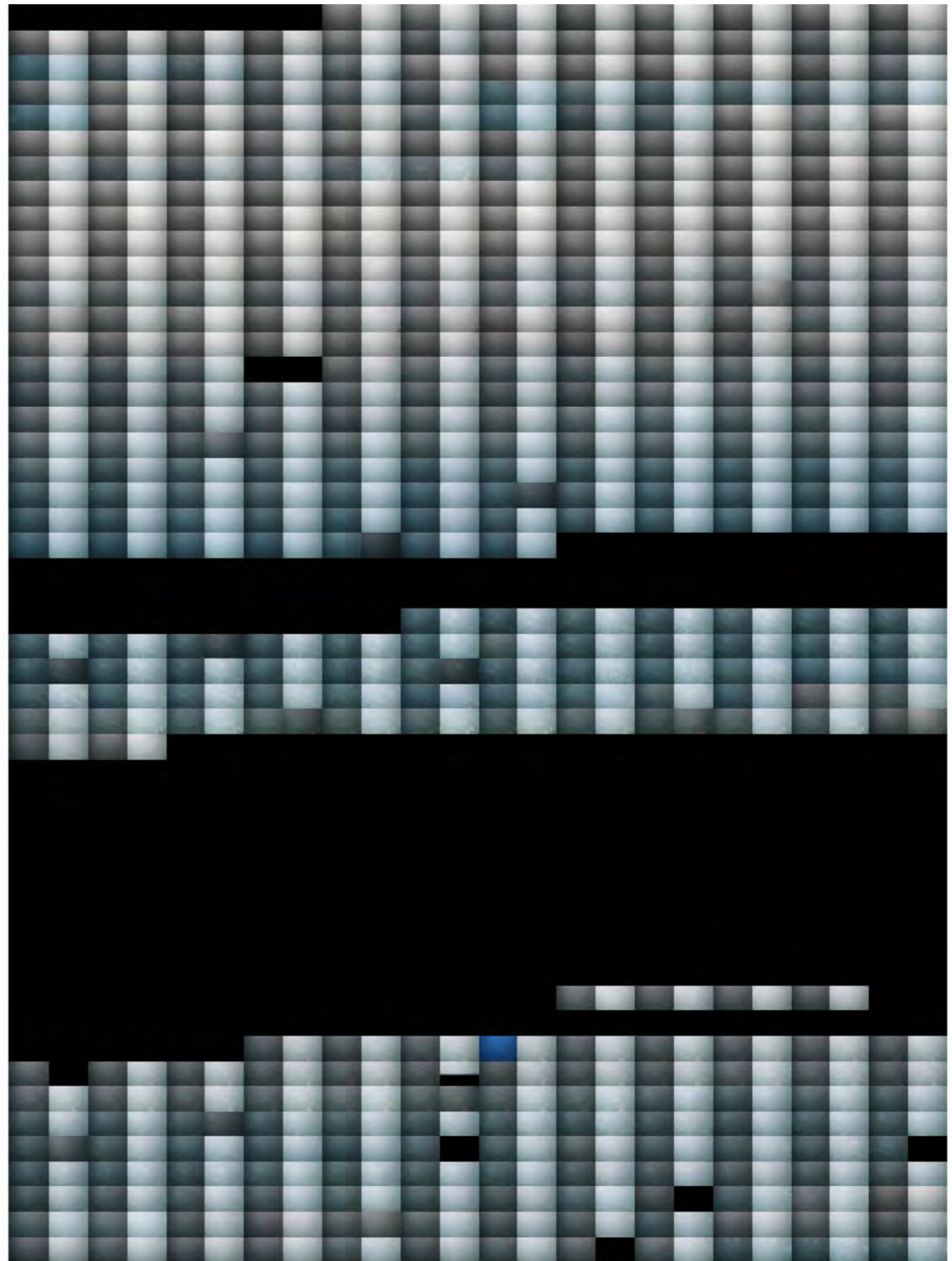
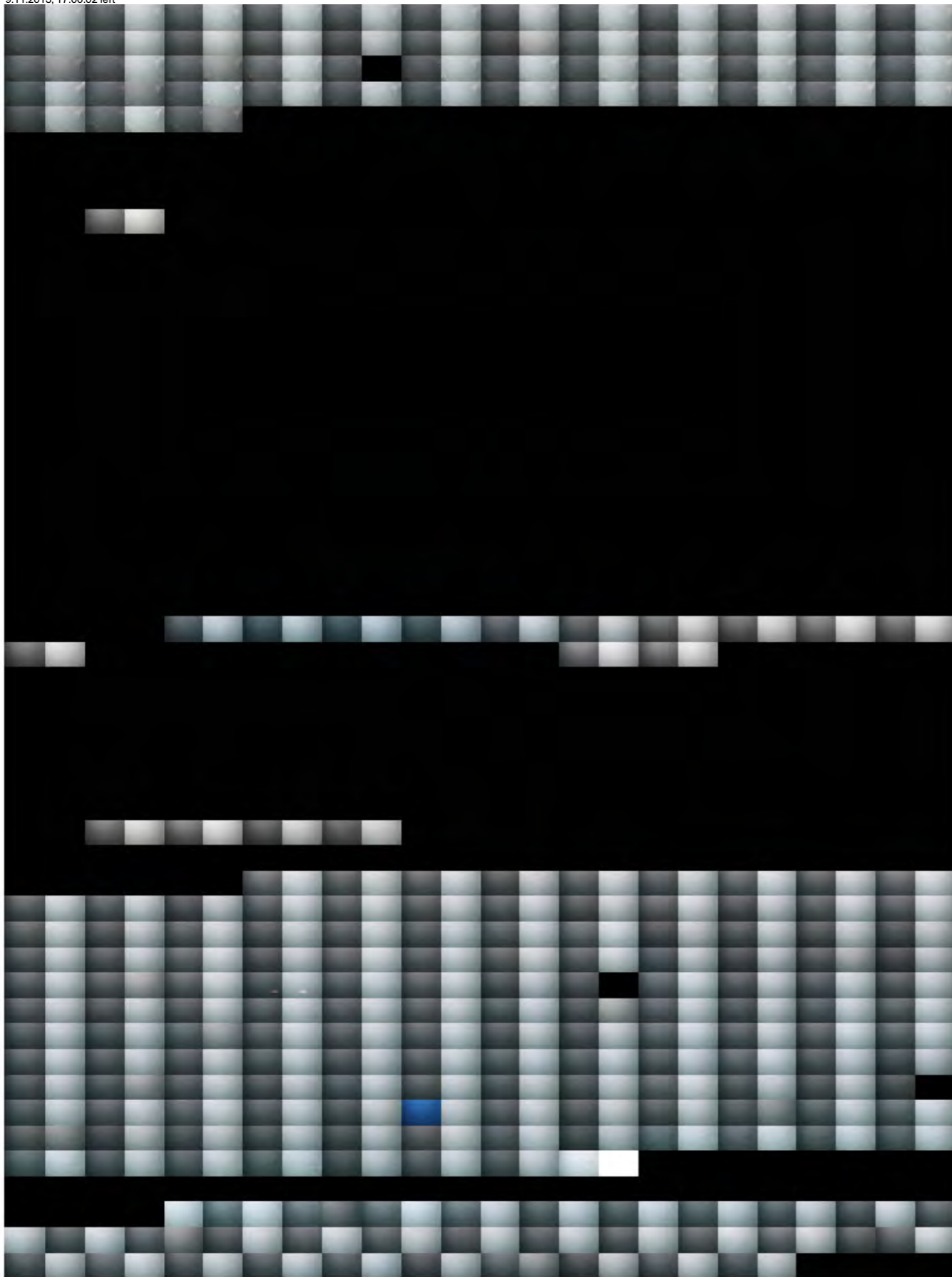




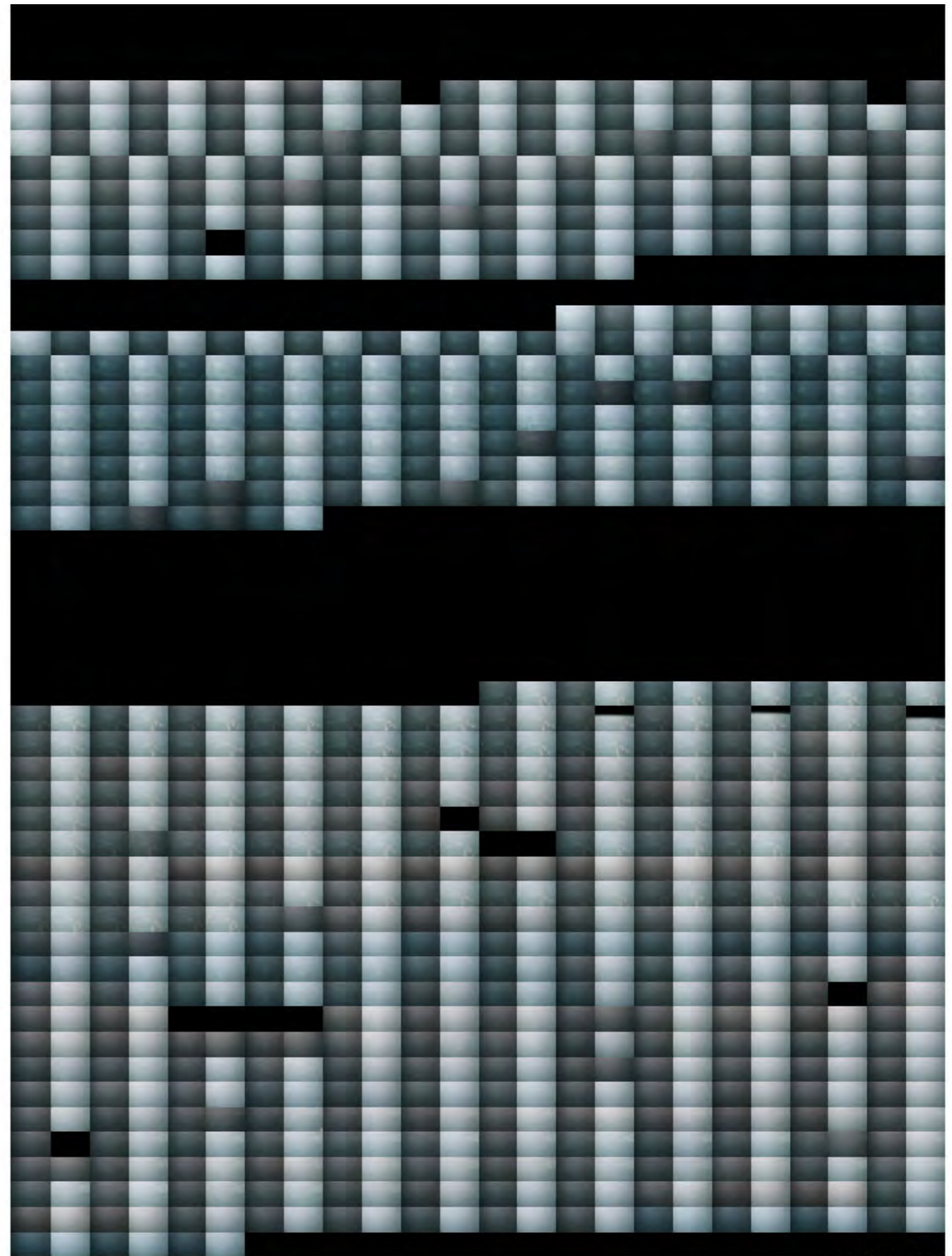
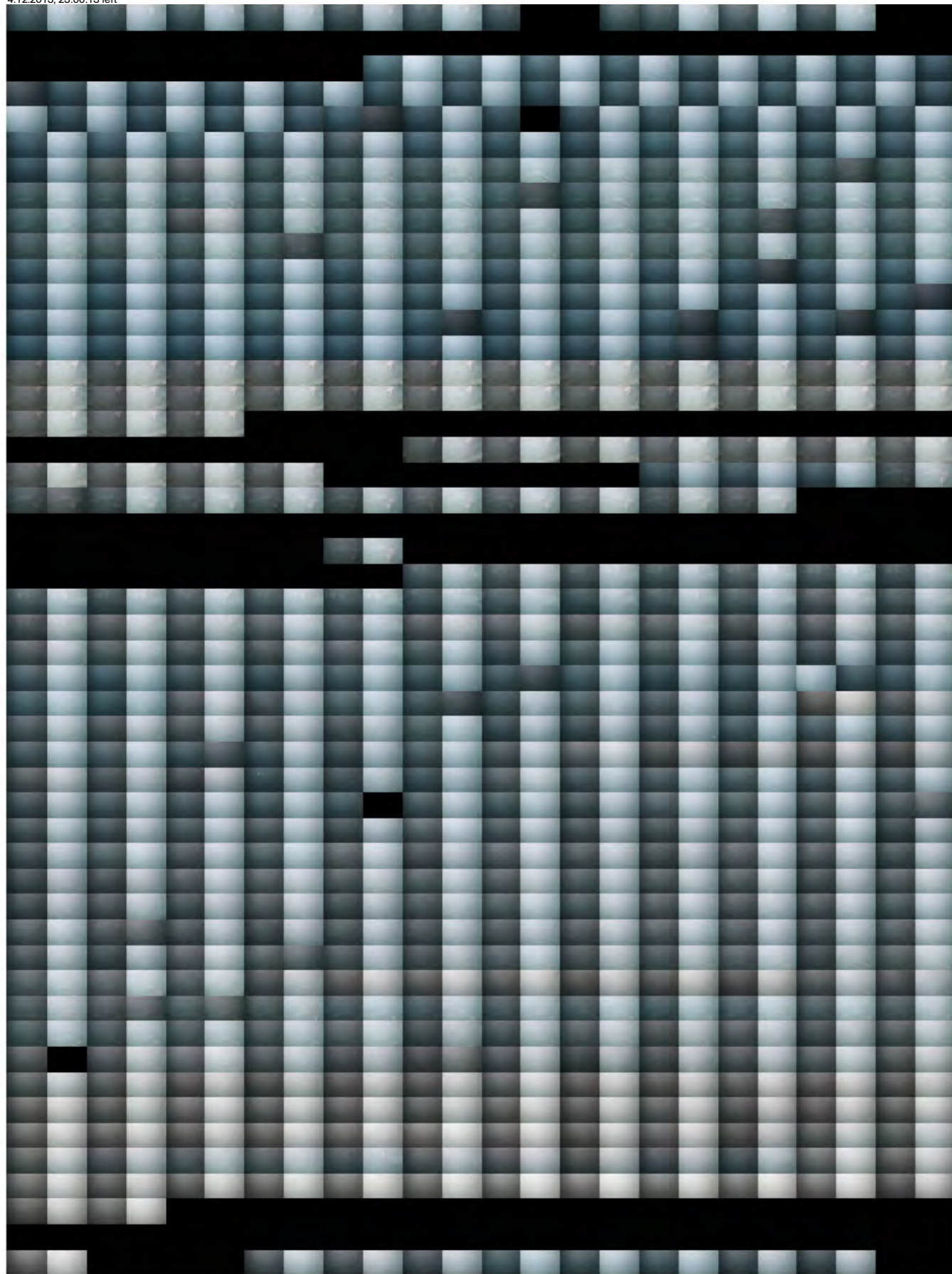


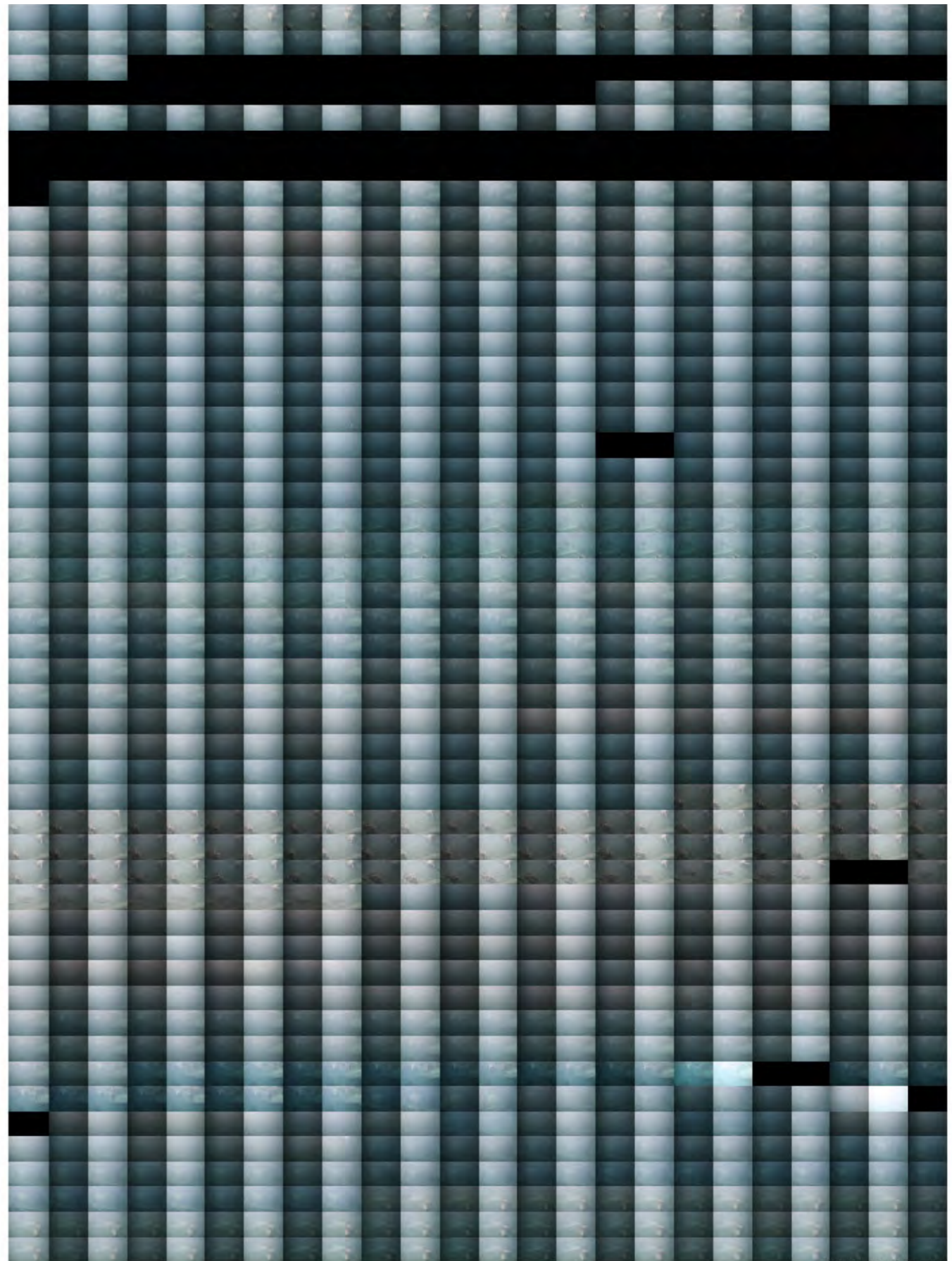
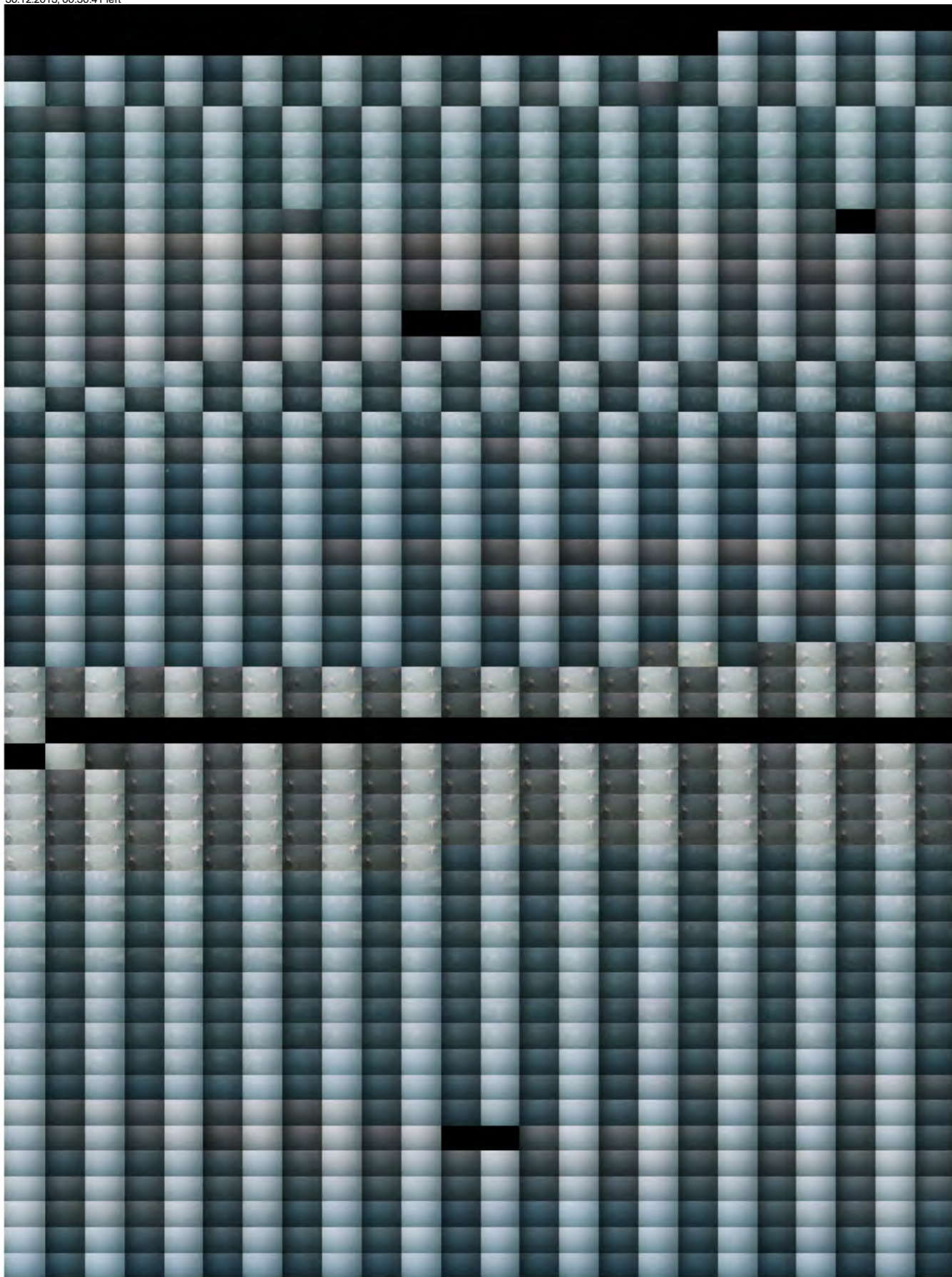


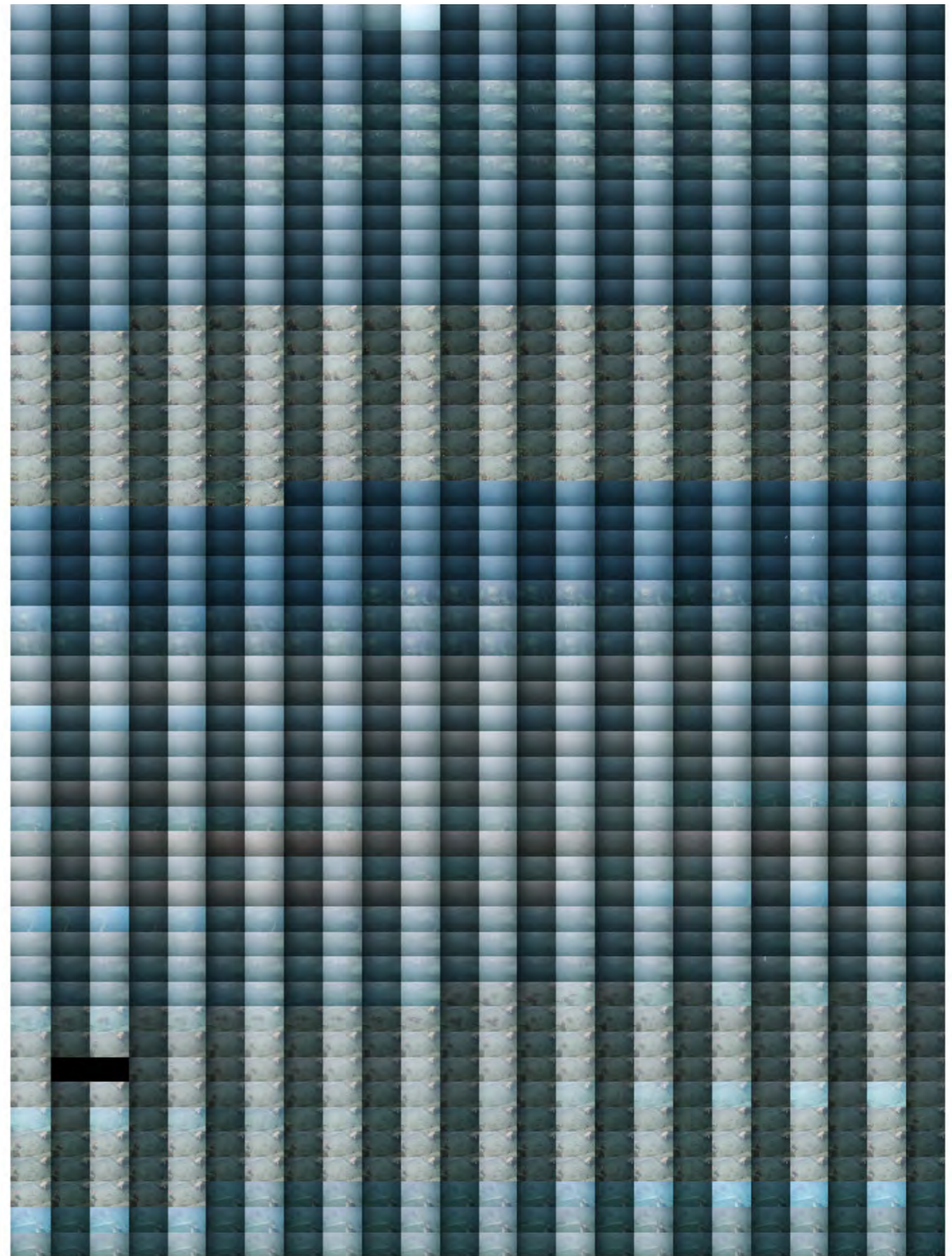
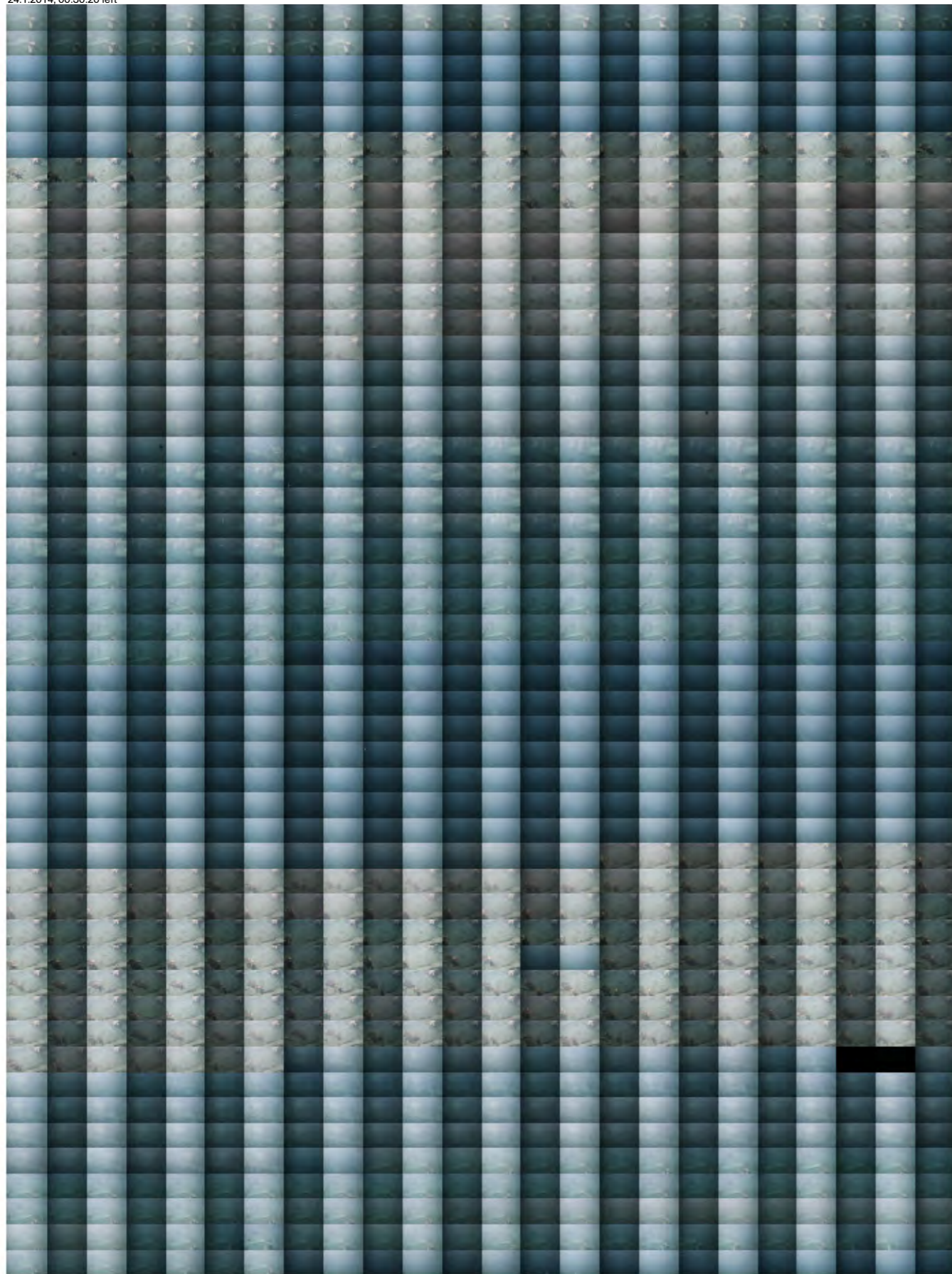
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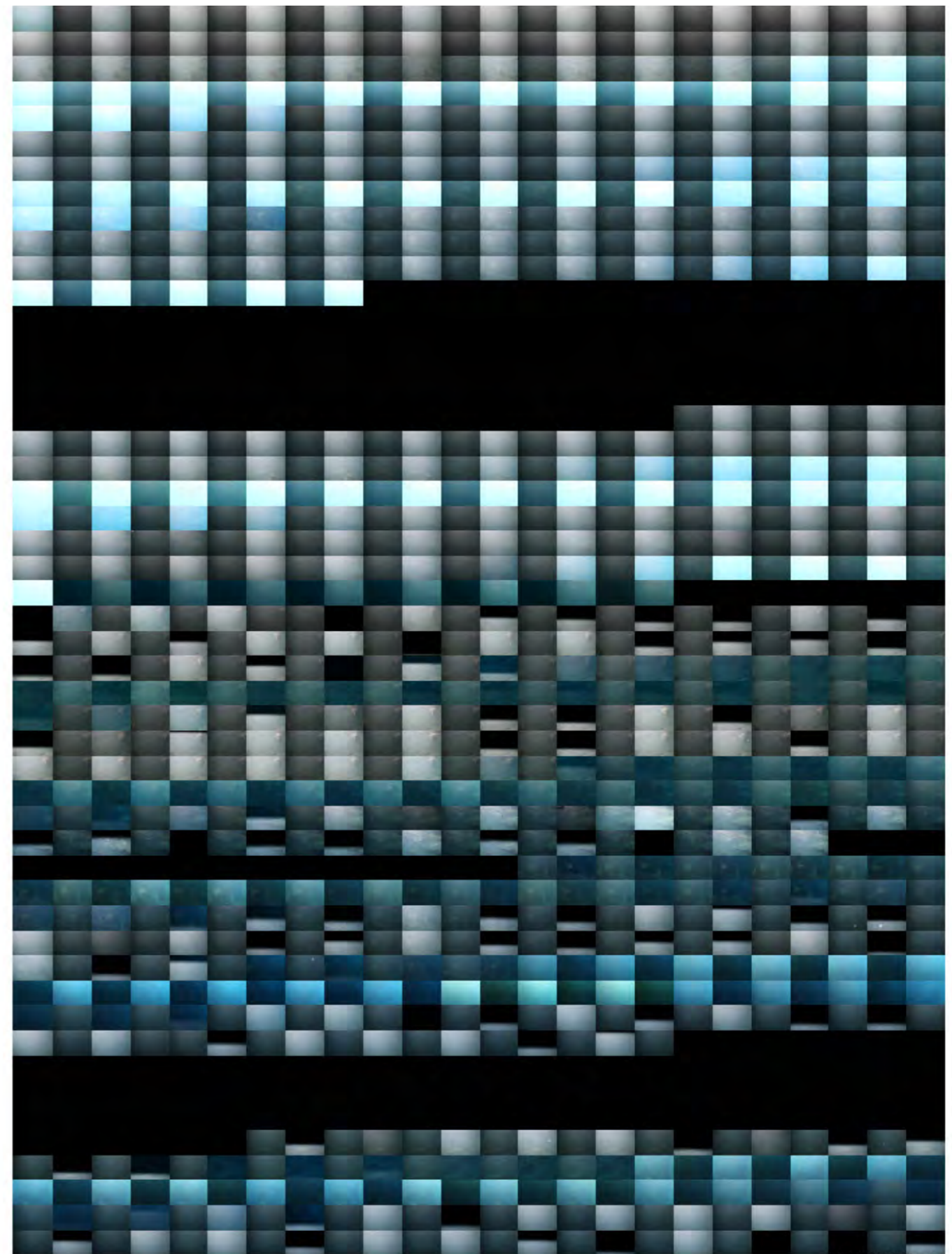
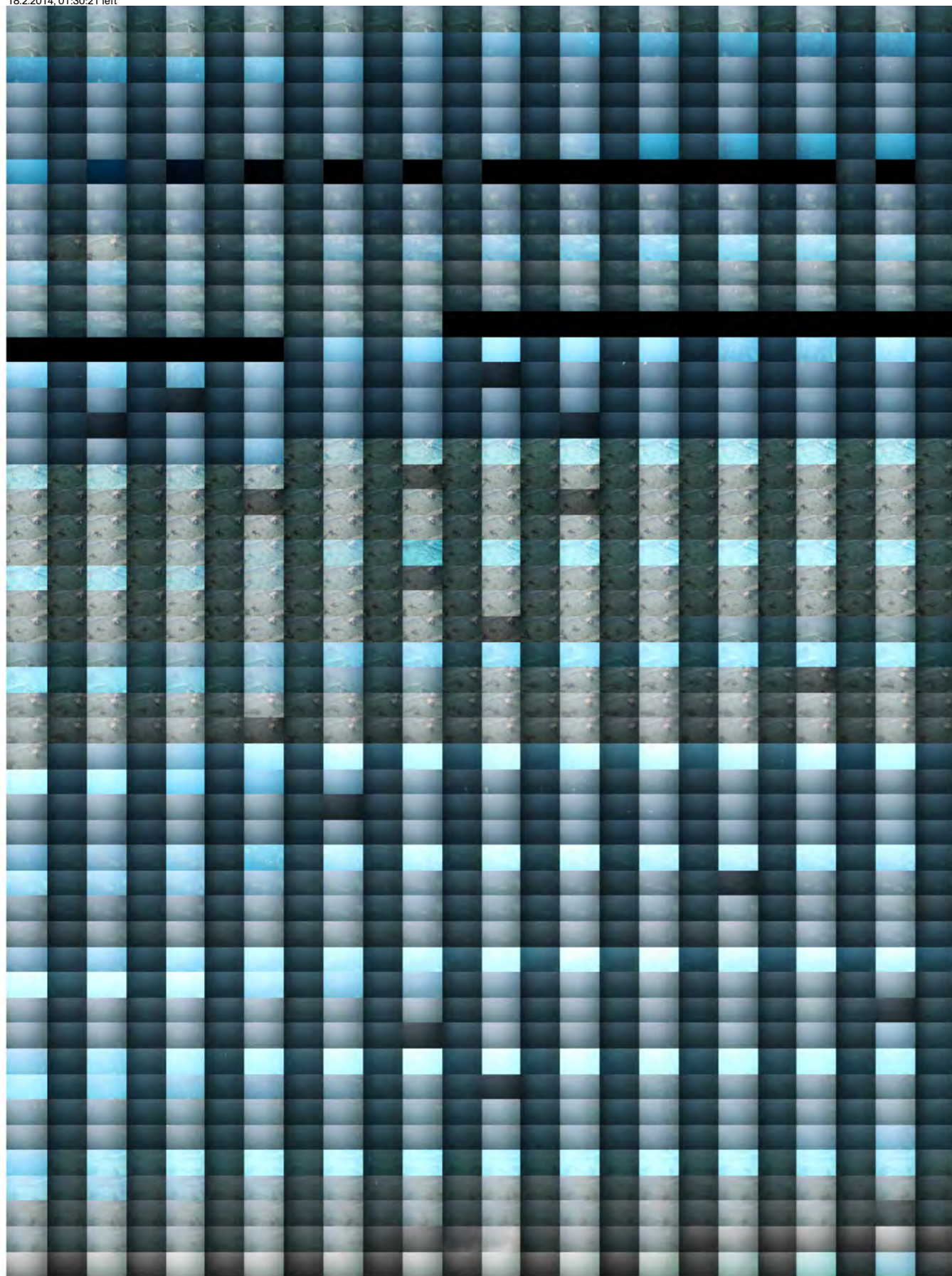
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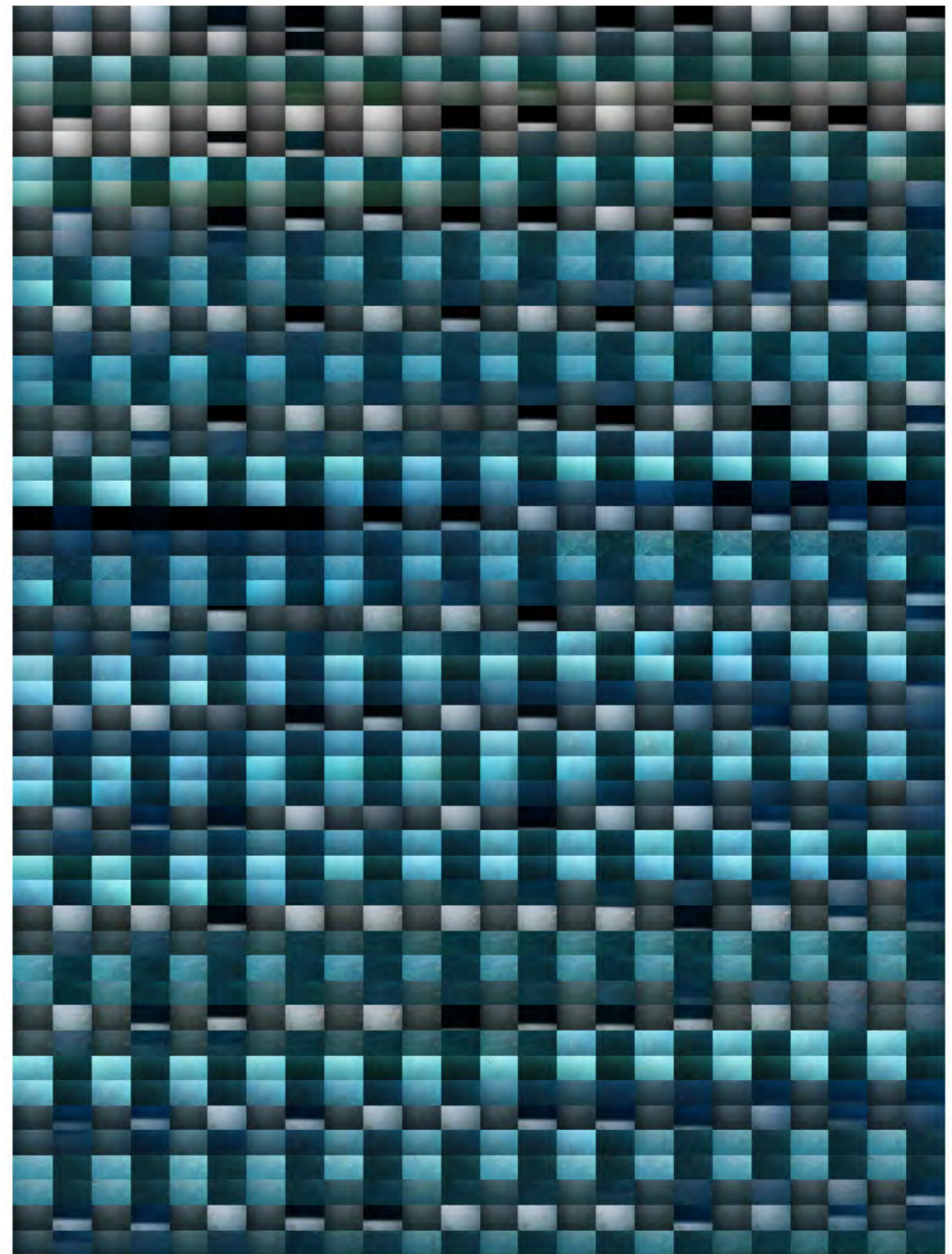
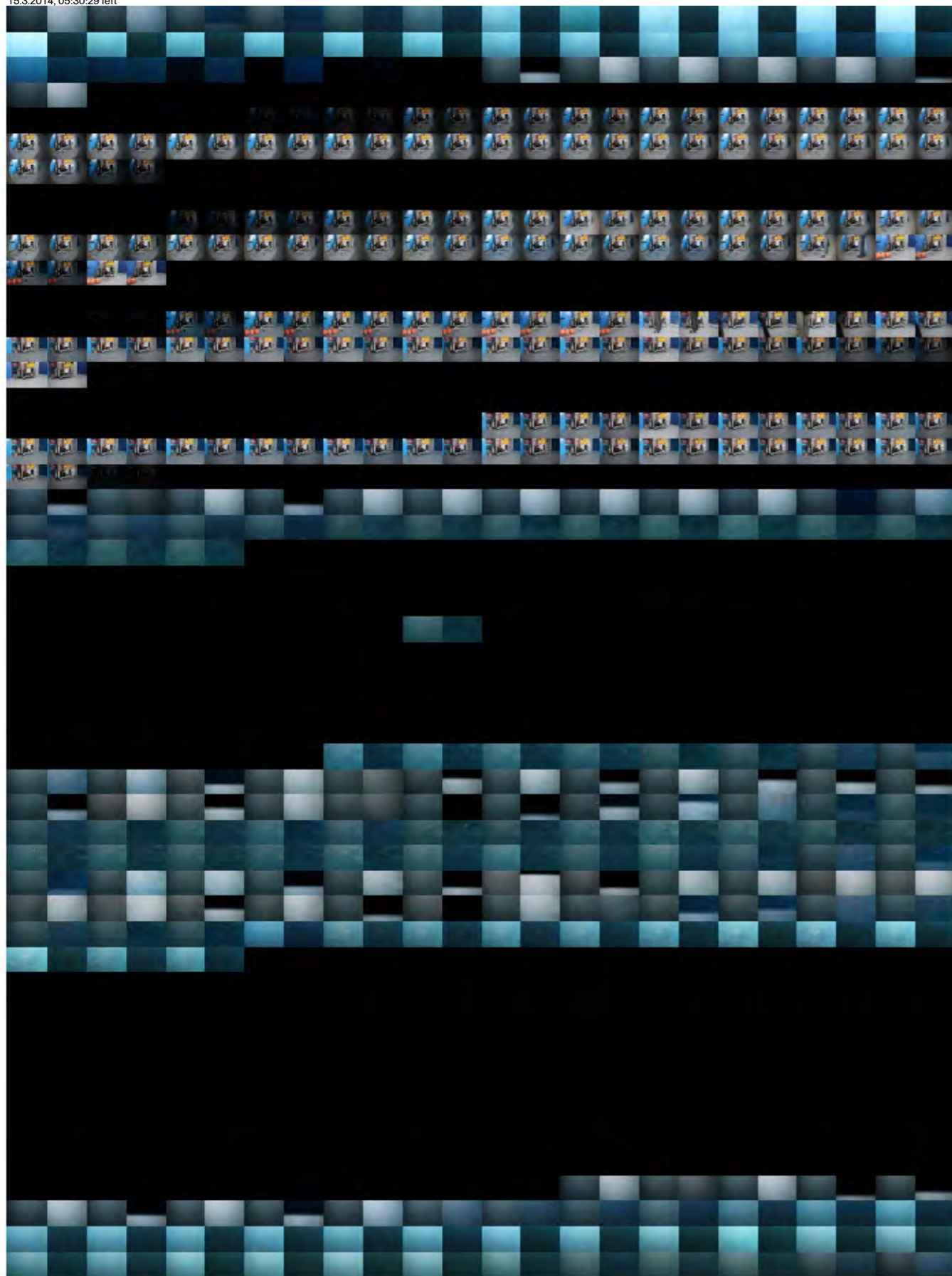


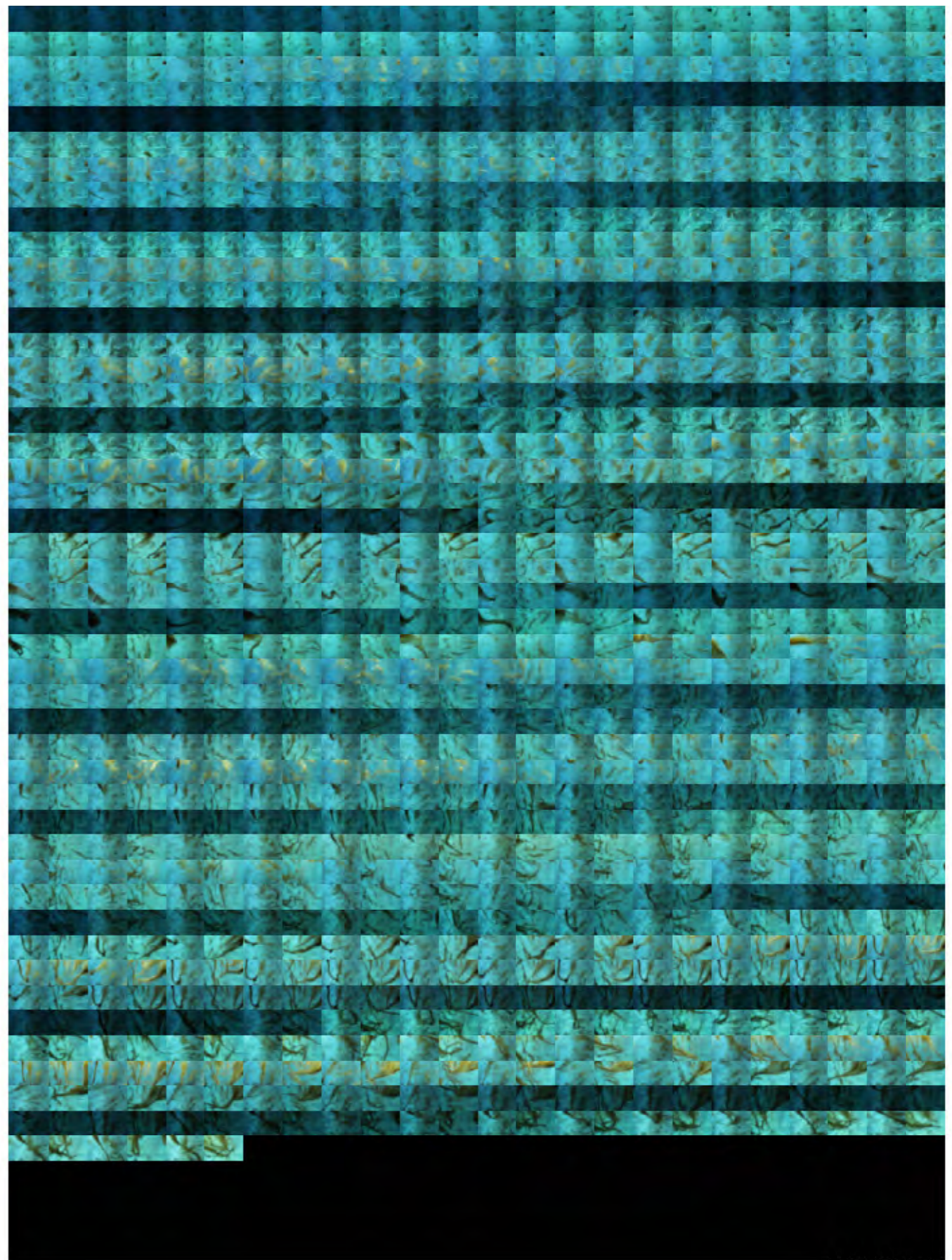
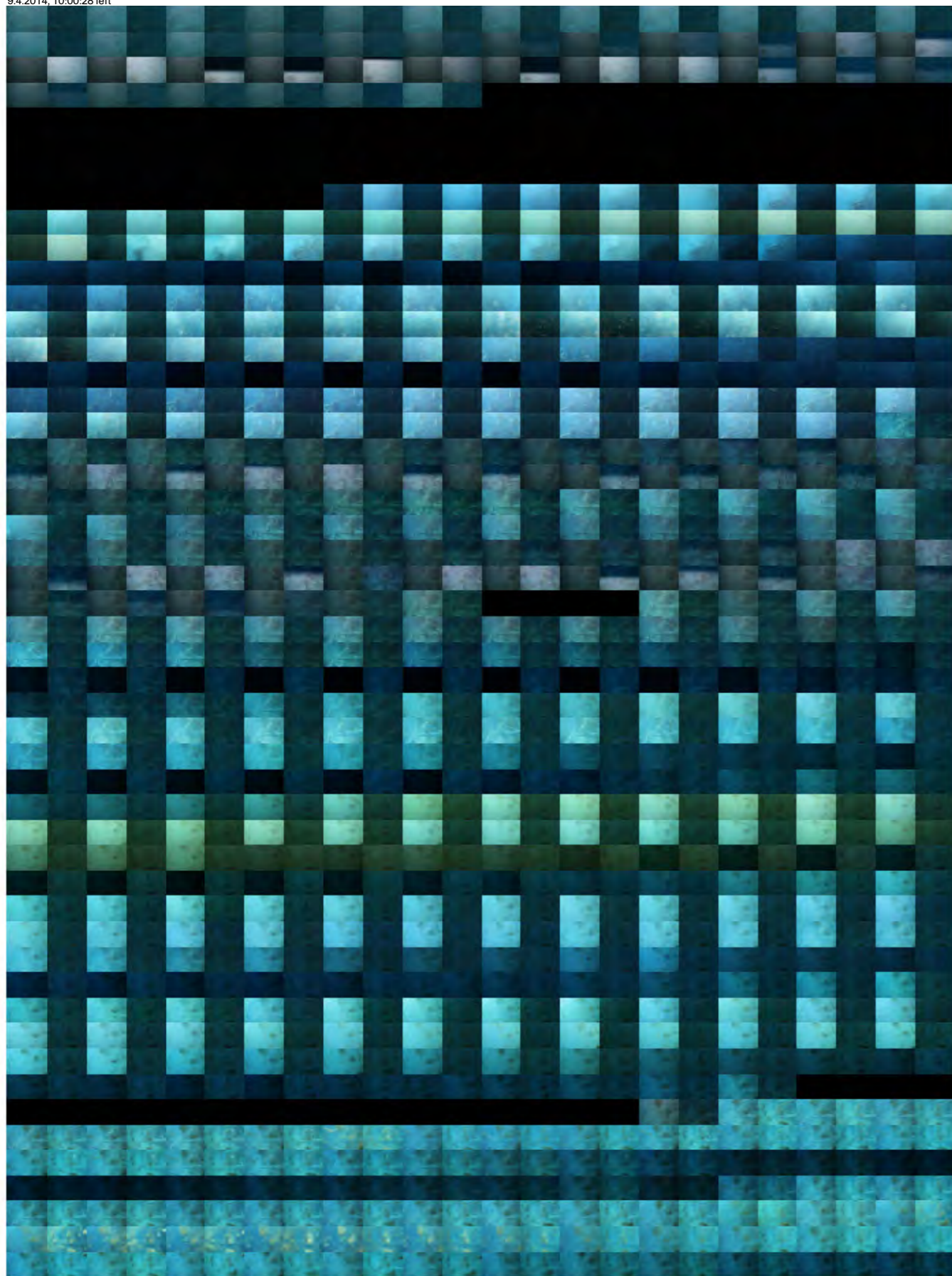


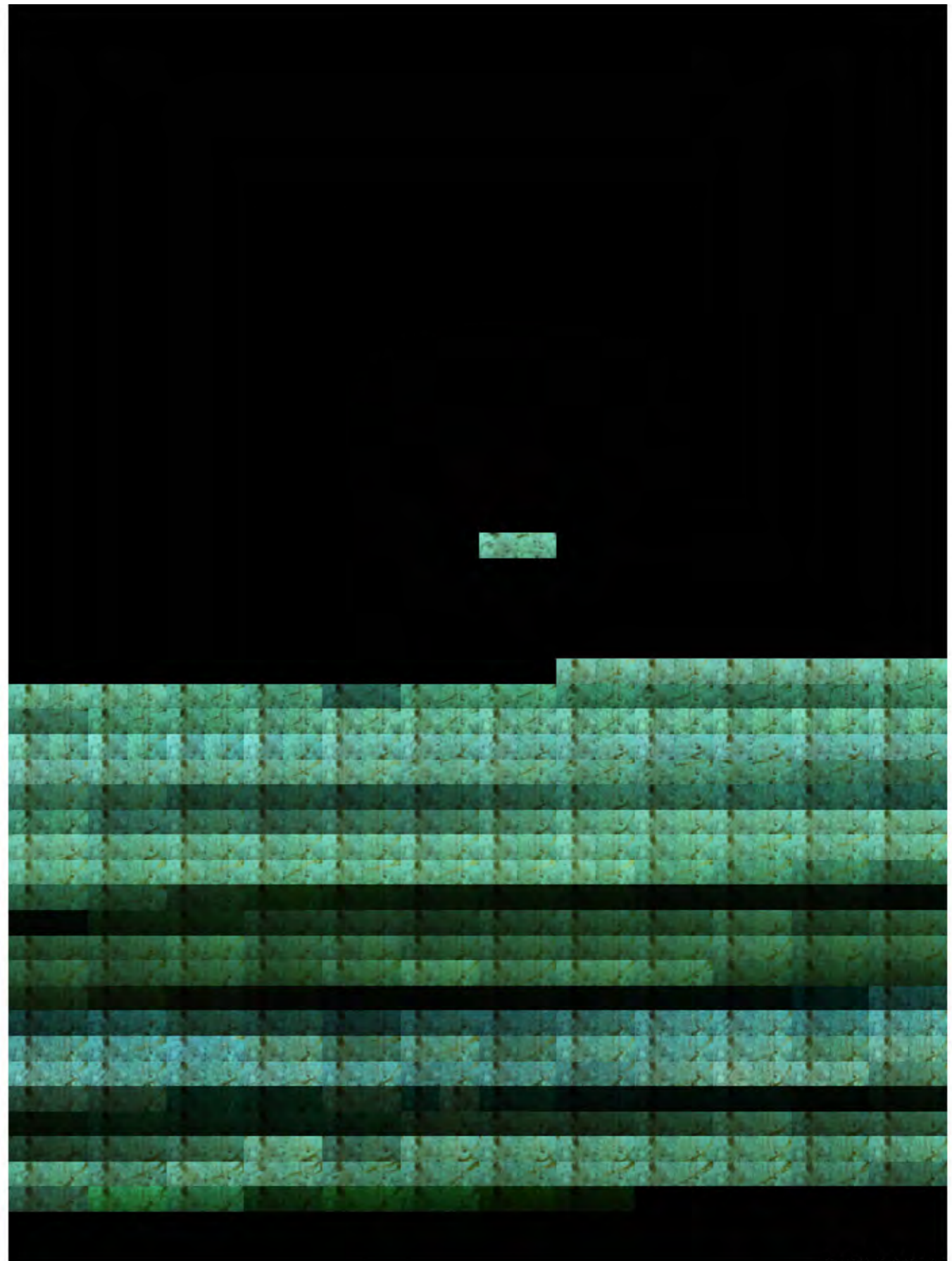
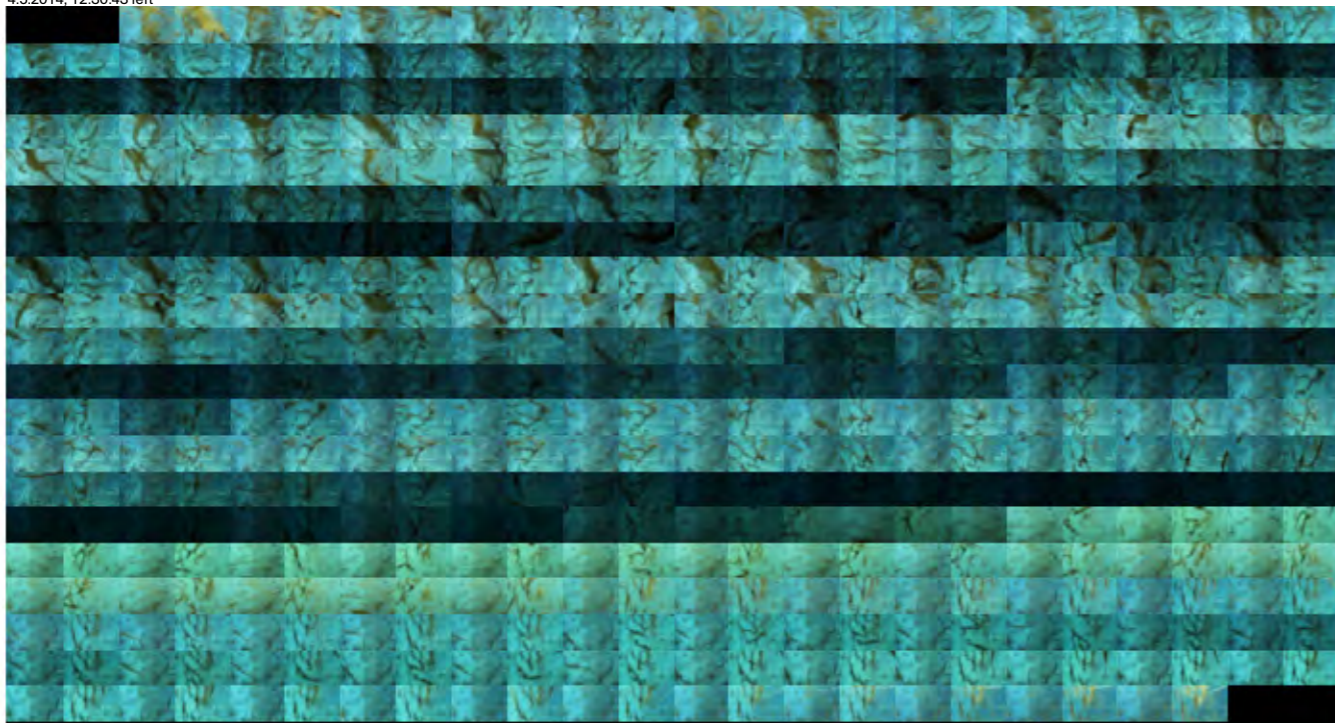
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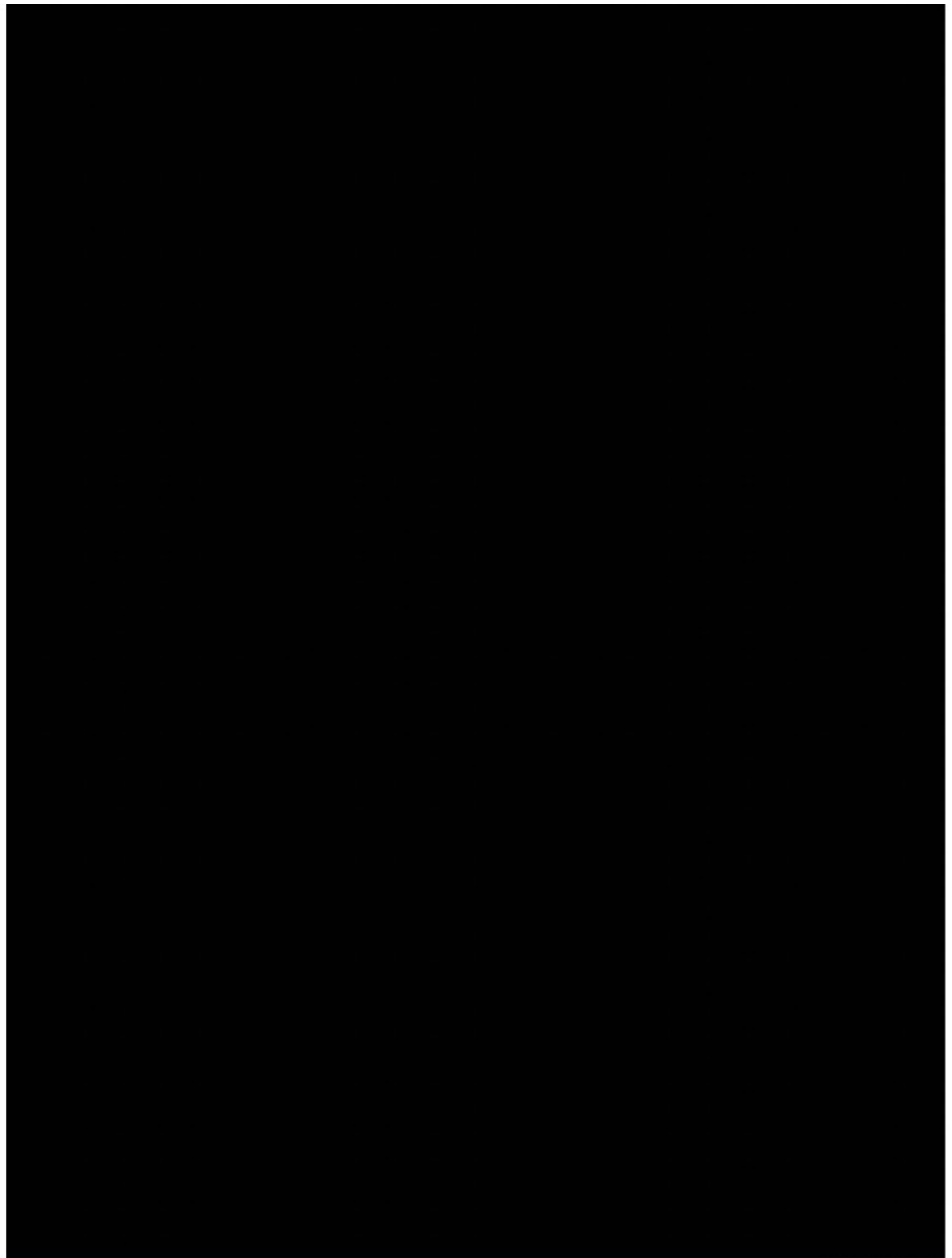
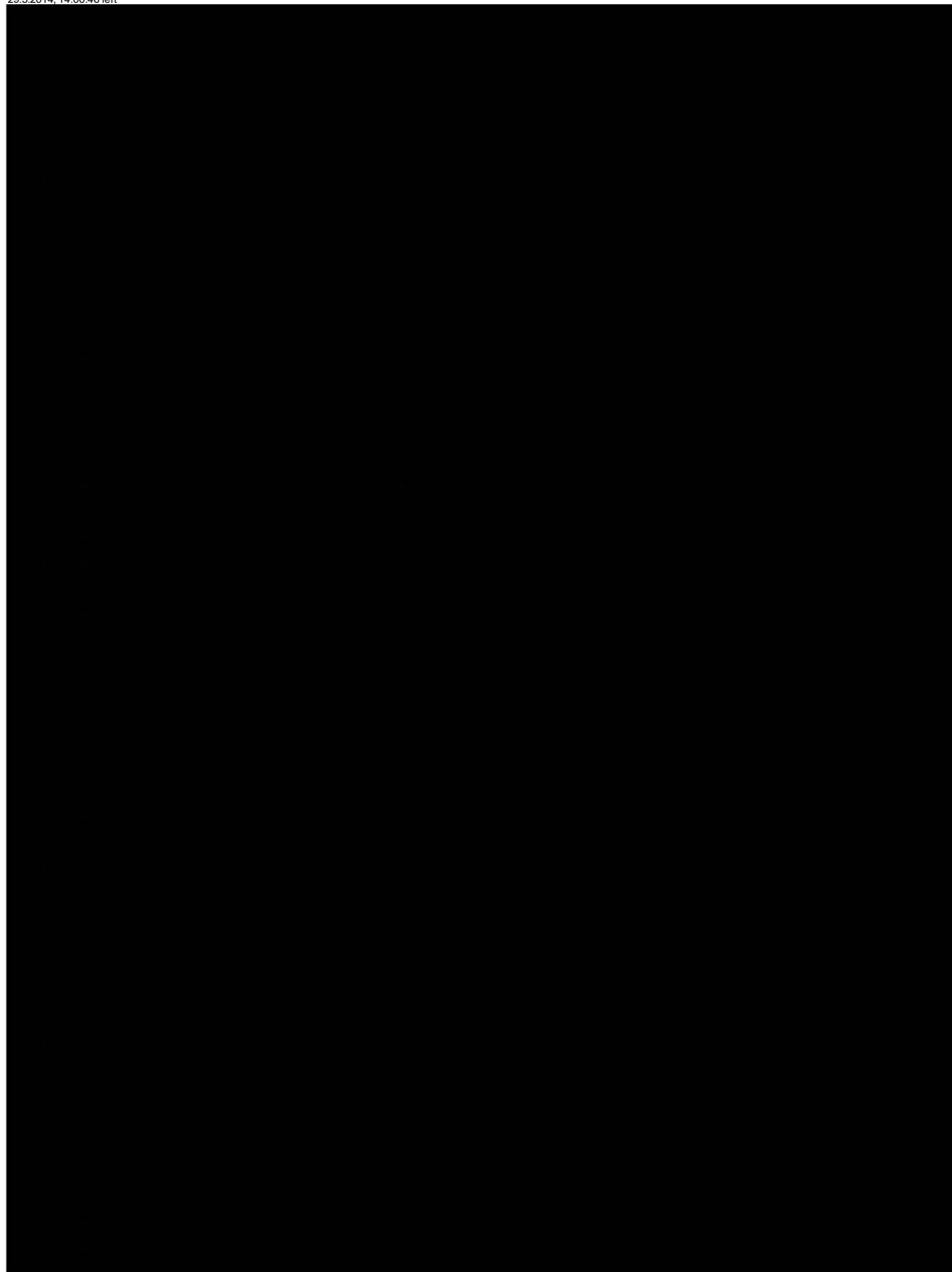


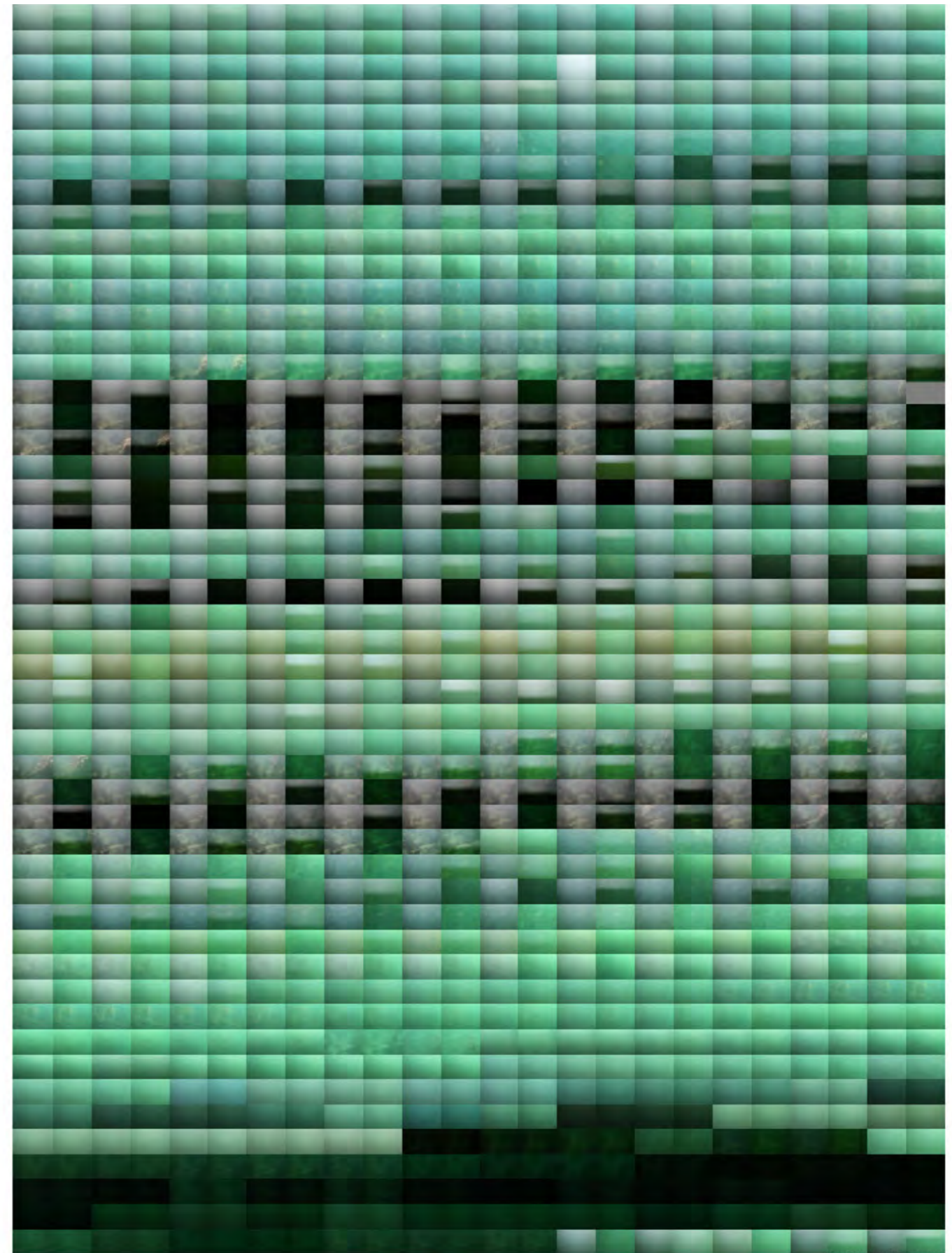
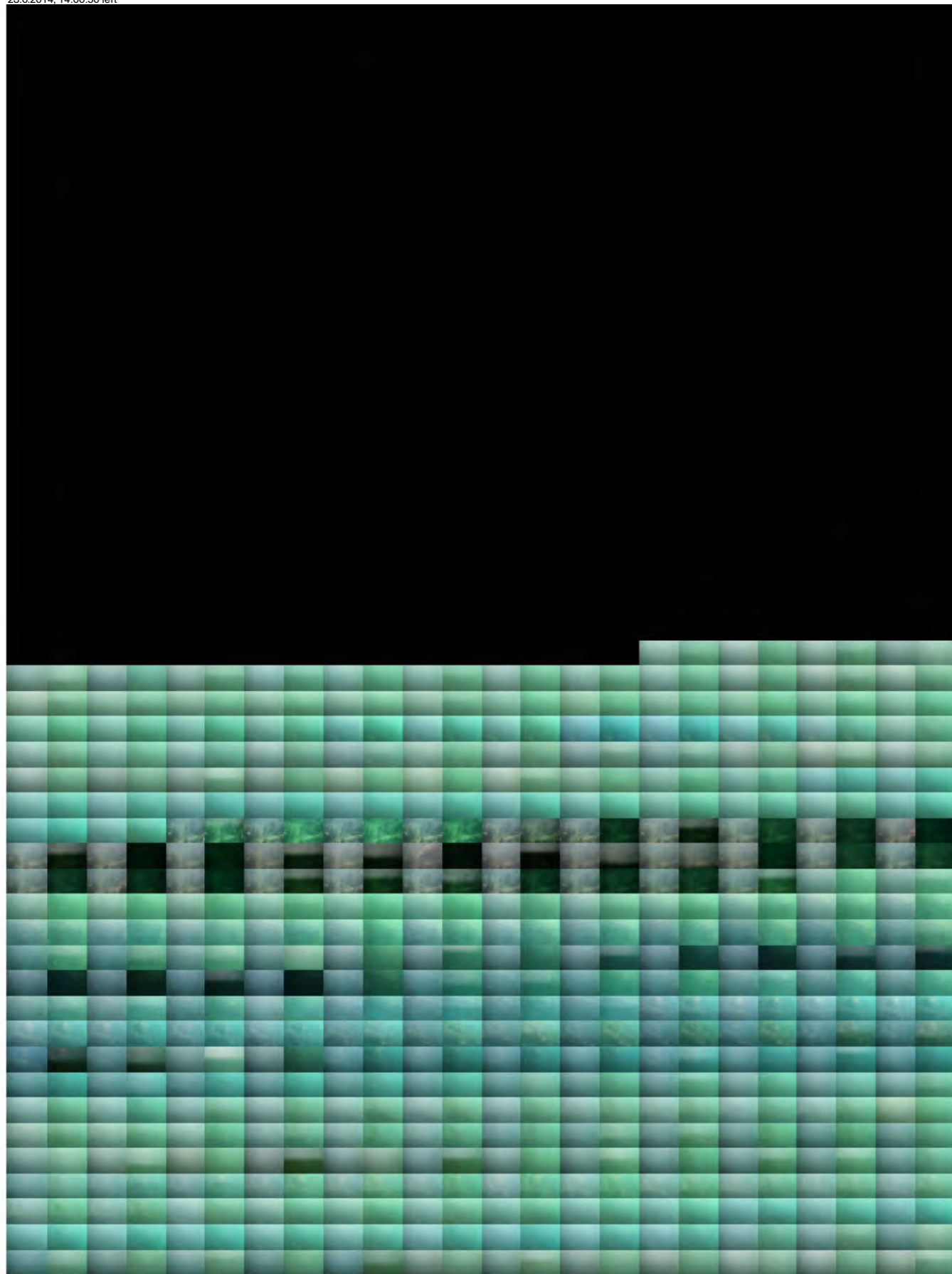
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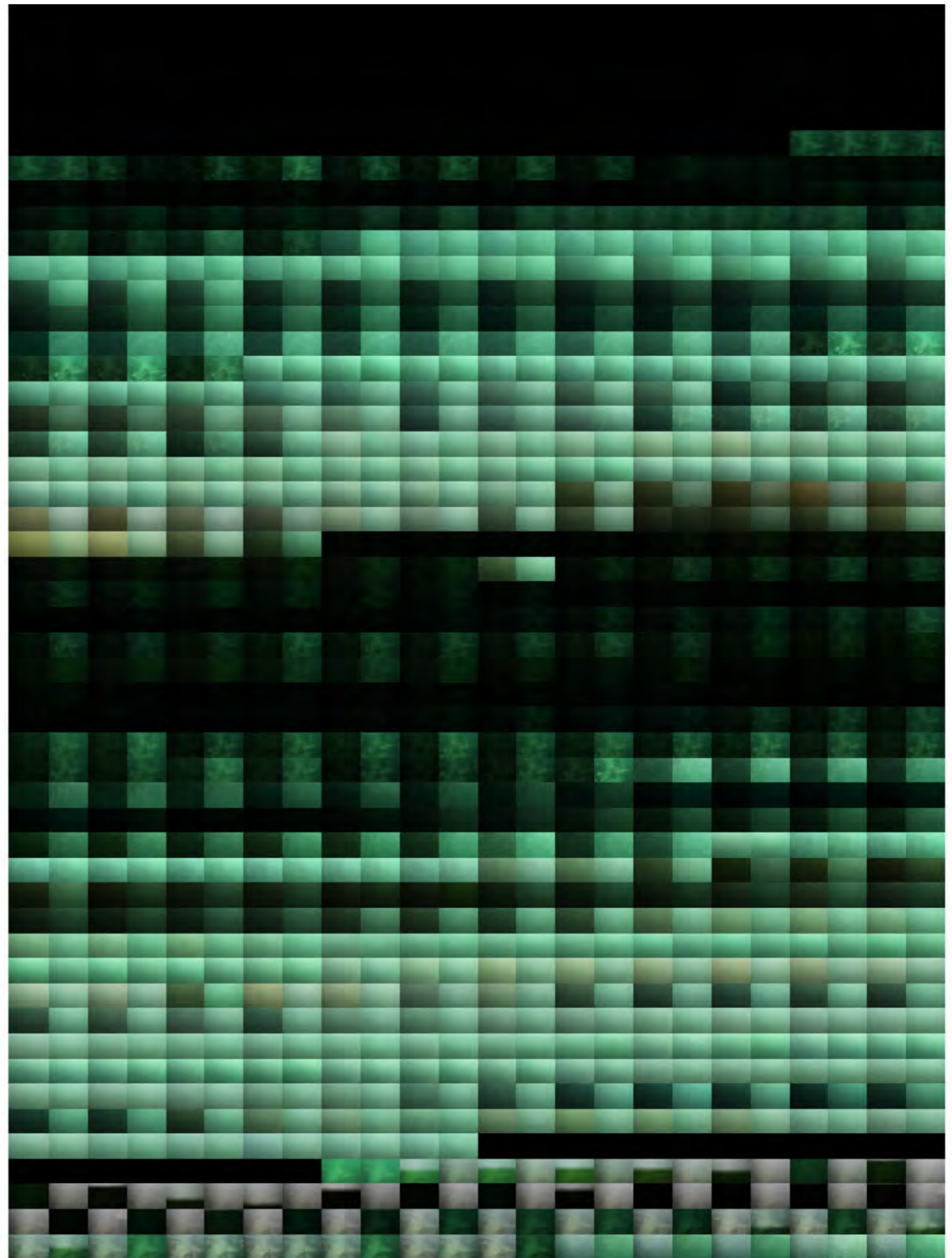
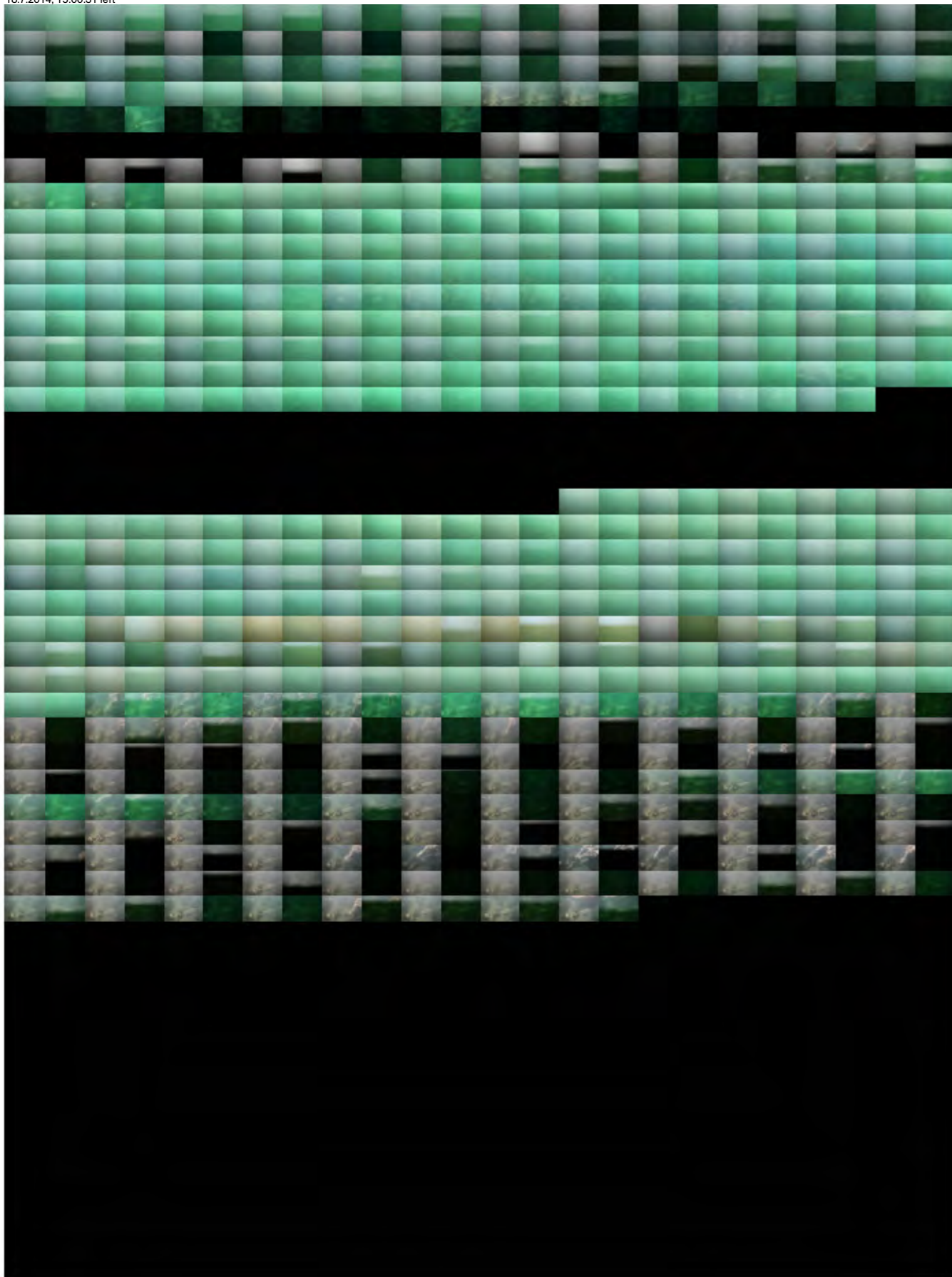




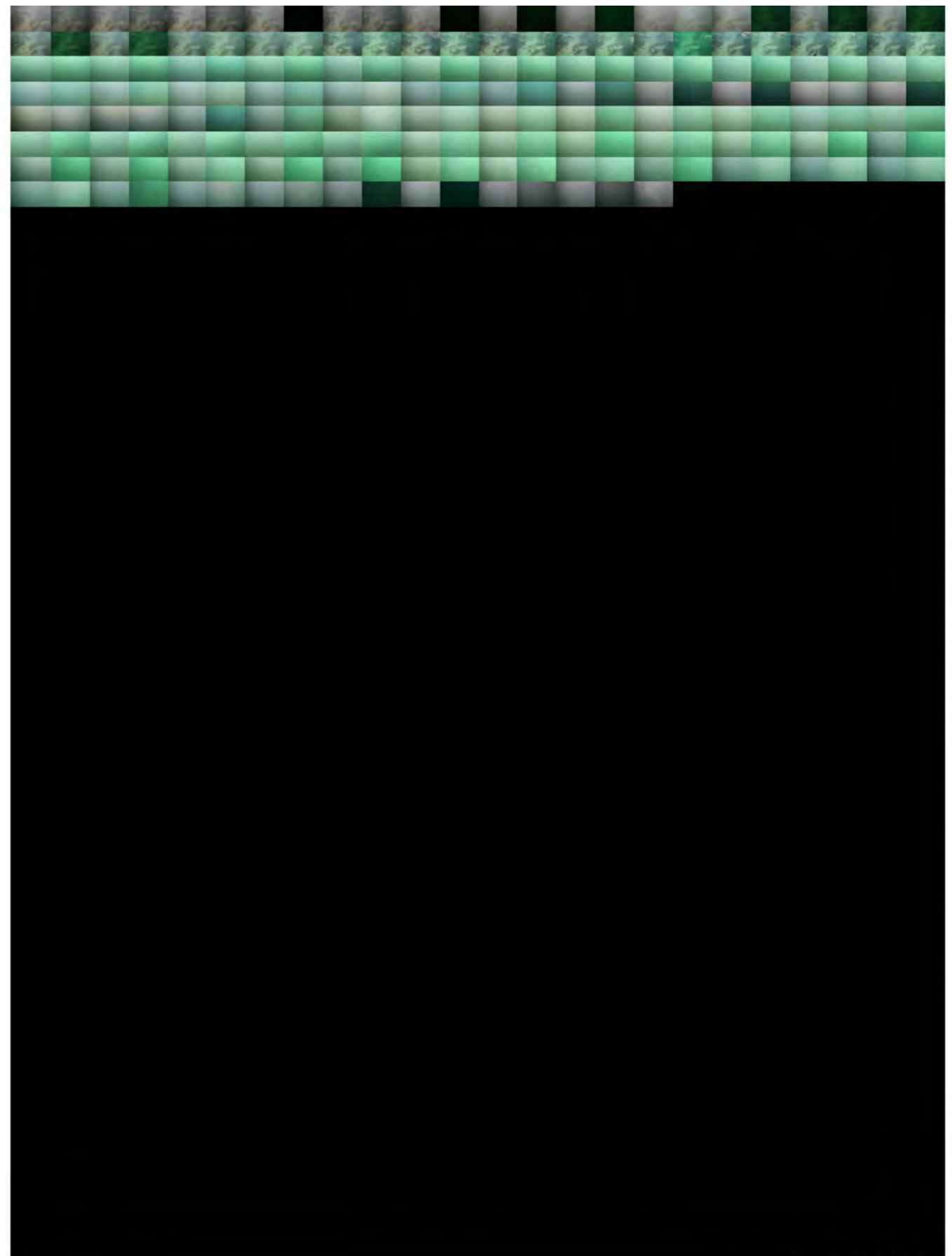
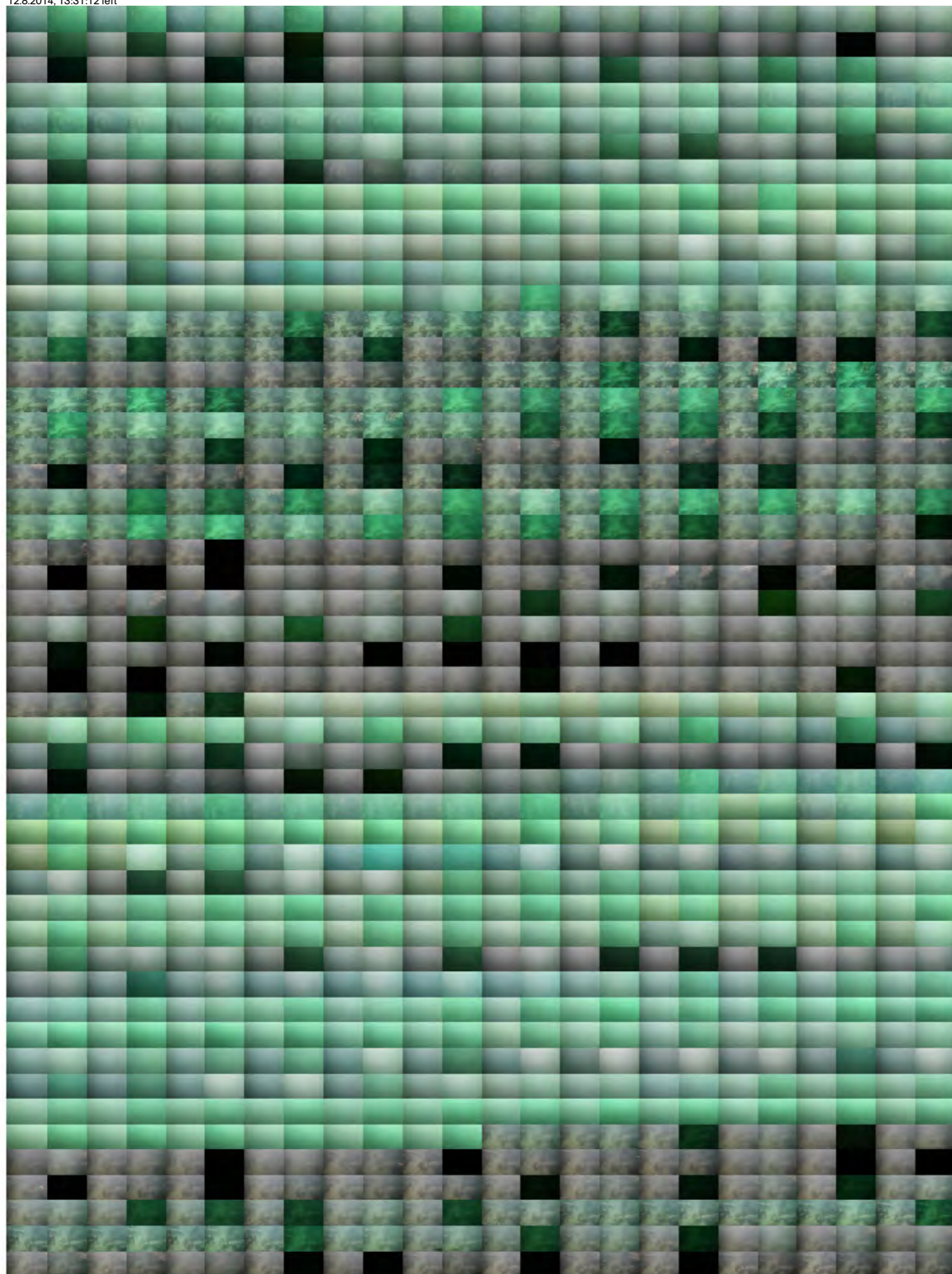




18.7.2014, 15:00:31 left



12.8.2014, 13:01:16 right





Imprint

Published in conjunction with the exhibition "Nixe. Homage to Ludwig Salvator in Science, Research, and Art," October 8–10, 2015, musikprotokoll 2015, Steierischer Herbst, Graz (commissioned work).

Editor
Hannes Rickli

Published as volume 16 of the Institute for Contemporary Art Research (IFCAR) series, Zurich University of the Arts (ZHdK).

All visual and audio material presented in this volume was developed within the research project "Computer Signals: Art and Biology in the Age of Digital Experimentation," Institute for Contemporary Art Research (IFCAR), Zurich University of the Arts (ZHdK), www.ifcar.ch.

Cooperation partners
Philipp Fischer, Alfred-Wegener-Institute, Helmholtz Center for Polar and Marine Research, Biological Institute Heligoland

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The images and audio material published in this volume were part of the following exhibitions: "Hannes Rickli: Fischen lauschen. Beginning Data Transmission from the Arctic See (Listening to Fishes)," Schering Foundation, Berlin 2013 (www.zhdk.ch/index.php?id=88258) und "Cross Over: Photography of Science + Science of Photography," Fotomuseum Winterthur 2013 (www.zhdk.ch/index.php?id=88246).

This publication was supported by the Volkart Foundation, Winterthur.

Design
Hubertus Design

Figures

Front cover stereometric image left, 16.6.2012, 13:30:34.

Back cover stereometric image right, 16.6.2012, 13:30:34.

Page 2
RemOs1 after the fitting of the audio signal probes in the Diving Center workshop, Biological Institute Heligoland, 14.3.2012, 12:56:51.
Center bottom: Main body with stereometric cameras, computer, induction coils for the audification of electromagnetic fields.
Center top: Flash-light body.
Center left: Webcam body, contact microphone for the audification of mechanical vibrations.
Top left: Hydrophone (sound microphone), blue power supply and glass-fiber data cable.
Size: 115 × 220 × 42 cm.

Page 3
Top: Webcam image of the Zeppelin Observatory, Norwegian Institute for Air Research with view of the Koldeway station, 8.10.2012, 17:00:35. Direction: North by north-east.
Center: Webcam image, old pier, Koldeway station, 8.10.2012, 17:00:35. Direction: North by north-east. *RemOs1* is positioned at the end of the pier, ca. 10 meters to the west.
Bottom: Webcam *RemOs1*, 8.10.2012, 17:00:35. The remote-controlled camera surveys the visual environment of the underwater observatory.

Page 5
Audio signals of the electromagnetic activity and the mechanical and acoustic environment of *RemOs1*. Release moment of the stereometric photos, 8.10.2012, 17:00:35. Order of the signals in the diagrams (from top): Contact microphone, webcam, external hydrophone, stereometric camera right, onboard computer, power supply.
Top: spectrogram, duration 10:00. Release moment of the camera at 05:35. Recognizable is the spectral arrangement of an acoustic/electrical input signal as it occurs: The color intensity corresponds to the energy density of the respective frequency band on the y-axis for a given time.
Center: Spectrogram, duration 01:30. Release moment of the camera at 05:35.
Bottom: Waveform, duration 01:30. Release moment of the camera

at 05:35. Recognizable is the oscillation process, especially the loudness as shown by the amplitude. Audio file: <http://computersignale.zhdk.ch/spitzbergen-demo/> (duration 03:00).

Page 6
Stereometric image left, 8.10.2012, release moment of the camera 17:00:35.

Page 7
Stereometric image right, 8.10.2012, release moment of the camera 17:00:35.

Pages 8 ff.
Excerpt from the *RemOs1* stereometric image archive, 15.9.2012, 11:00:00 to 19.9.2014, 01:00:00.

