

CHANGING ANTARCTICA - NEW POSSIBILITIES OF OBSERVATIONS WITH UAV

M. Korczak-Abshire¹, A. Zmarz², S.R. Karlsen³, M. Rodzewicz⁴, R. Storvold³, A. Kidawa¹, and M. Kycko,² K.J. Chwedorzewska¹

1. *Institute of Biochemistry and Biophysics Polish Academy of Sciences, Department of Antarctic Biology, Warsaw, Poland; e-mail: kchwedorzewska@ibb.waw.pl, mka@ibb.waw.pl; akidawa@arctowski.pl*
2. *University of Warsaw, Faculty of Geography and Regional Studies, Department of Geoinformatics, Cartography and Remote Sensing, Warsaw, Poland; email: azmarz@uw.edu.pl; marlenakycko@uw.edu.pl*
3. *Northern Research Institute Tromsø, Norway; e-mail: stein-rune.karlsen@norut.no; rune.storvold@norut.no*
4. *Warsaw University of Technology, Institute of Aeronautics and Applied Mechanics, Warsaw, Poland; e-mail: miro@meil.pw.edu.pl*

ABSTRACT

To provide an information on impact of climate change on Antarctic ecosystem and biodiversity, differences in the range and abundance of important ecological bioindicators (plant communities, birds and marine mammals) were studied. A long-distance fixed-wing Unmanned Aerial Vehicles (UAVs) were used to collect baseline geospatial environmental data from King George Island, South Shetland Islands, the Western Antarctic Peninsula region, which exhibiting rapid regional changes in the last 50 years.

During two austral summer seasons (Oct 2014 – Jan 2015 and Nov 2015– Jan 2016) four models of UAV equipped with digital cameras, GPS sensors and autonomous control systems were used to collect digital image data. Flights have been designed over two Antarctic Specially Protected Areas (ASPA), No. 128 (Western Shore of Admiralty Bay) and 151 (King George Bay), additionally Chabrier Rock and Shag Island located inside the Admiralty Bay. Aerial photography taken from low altitudes (350 m AGL) made it possible to obtain images with ground sample distance for the digital camera <5cm. All completed flights covered the area of 14,6 km².

Obtained material allowed to identified the objects, such as nesting penguins and breeding seals and to develop high resolution vegetation maps: create orthophoto maps as well as 3D models. Results were compared to the historical data from last forty years. The data were used to monitor climate change effects on King George Island, in particular, quantifications of seals and penguins populations, flora distribution, and glacier retreats. This data collected in a Polish-Norwegian project: "A novel approach to monitoring the impact of climate change on Antarctic ecosystems - MONICA" will be used as a reference for long-term monitoring.

ACKNOWLEDGEMENTS

The research leading to these results has received funding from the Polish-Norwegian Research Programme operated by the National Centre for Research and Development under the Norwegian Financial Mechanism 2009-2014 in the frame of Project Contract No 197810.