

Black Carbon deposition on snow from Antarctic Peninsula

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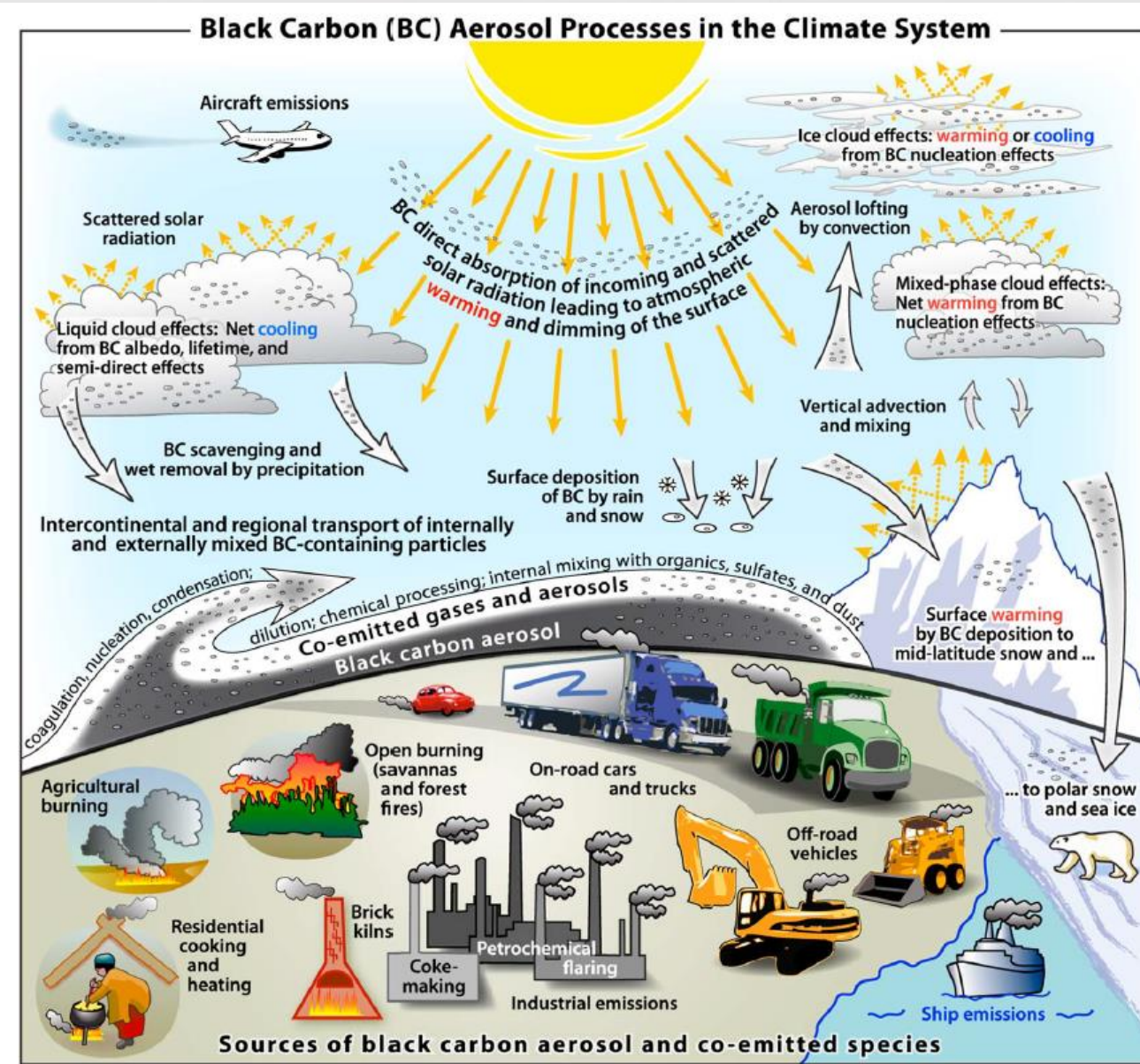
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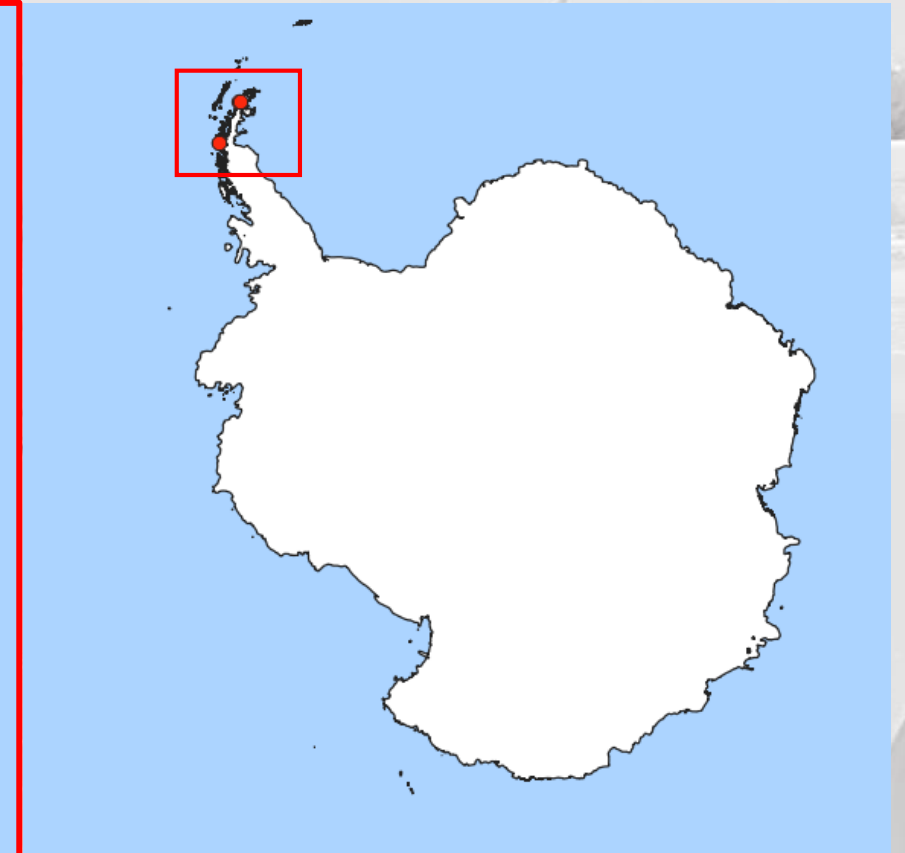
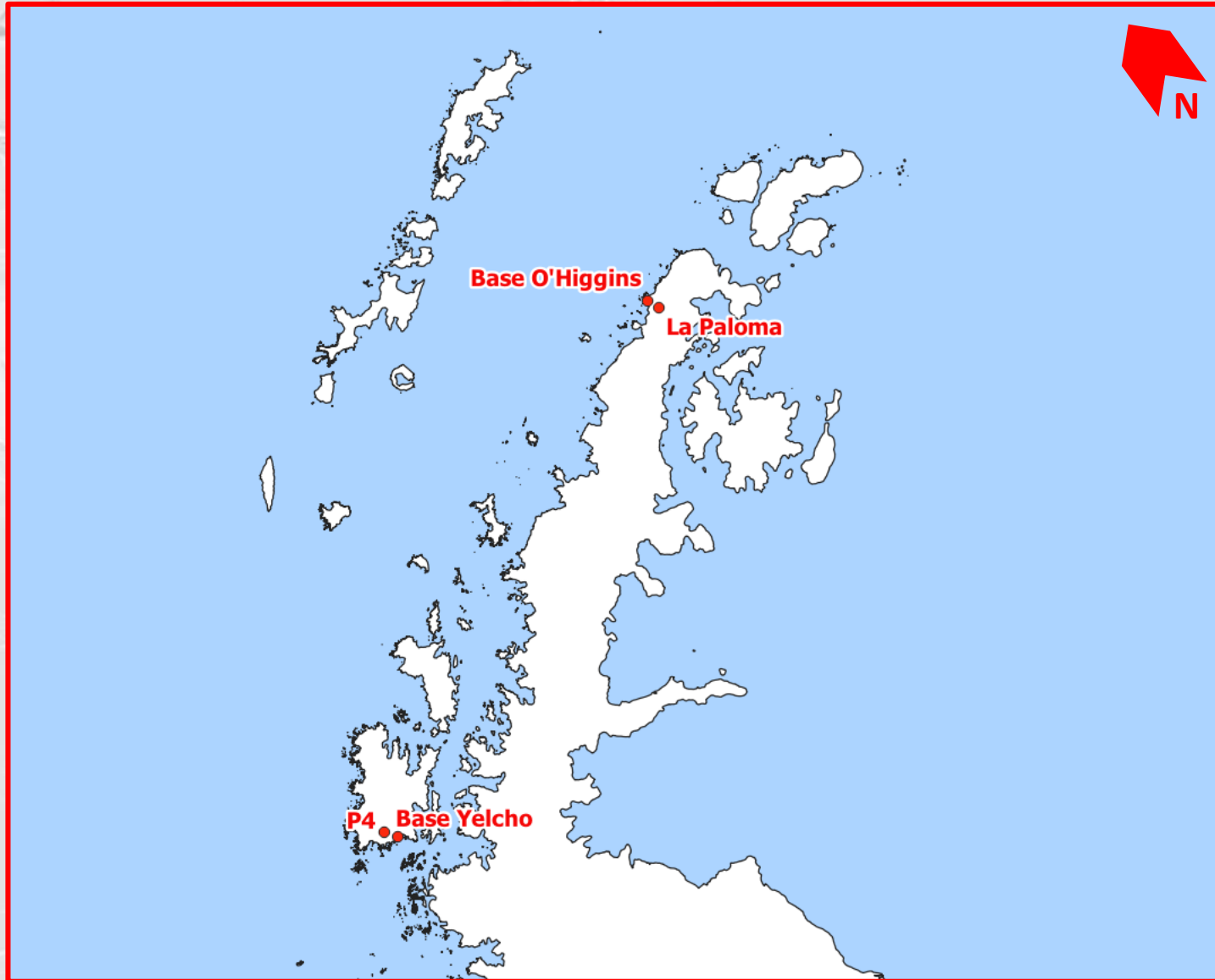
INTRODUCTION



AIM OF THIS WORK

To determine BC concentration on shallow snow from the Antarctic Peninsula (AP), to fill gaps and increase the knowledge about the sources, pathways and transport of atmospheric BC in this area of environmental concern, assessing the potential origin of the deposited BC, and establishing a possible relationship with the human activities that are carried out in the AP

STUDY AREA AND SAMPLING POINTS



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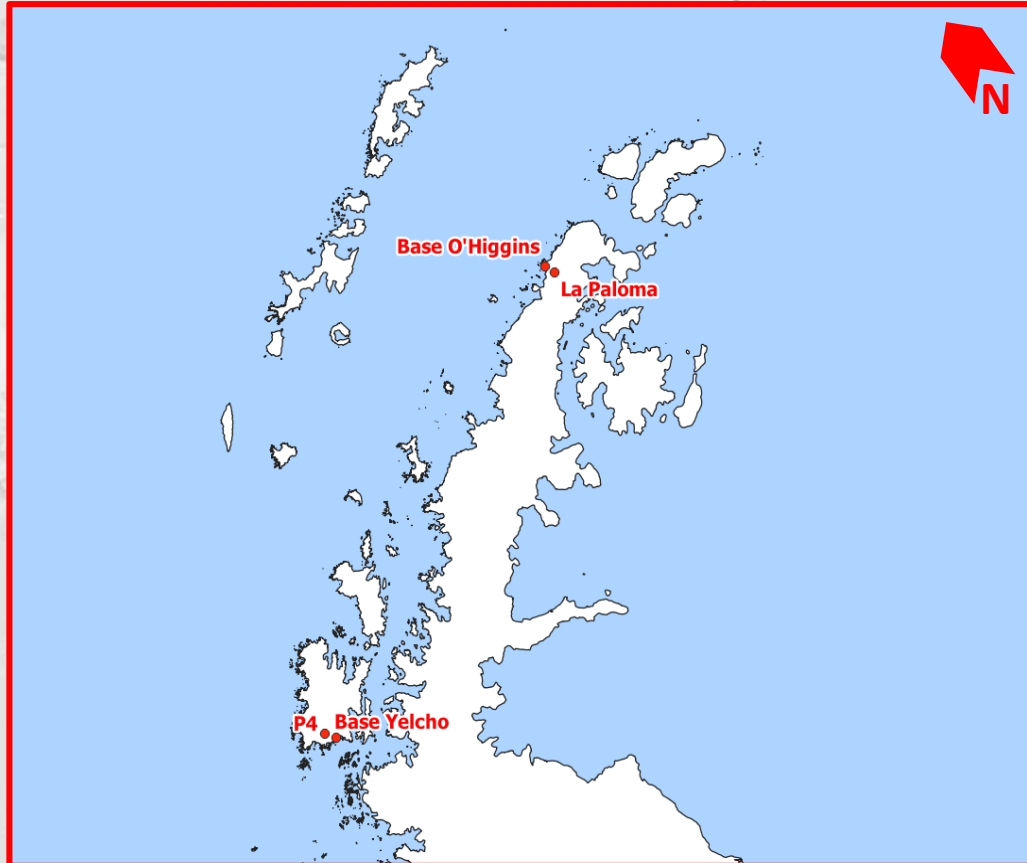
4 sampling points

Base O'Higgins (BO 2014): ($63^{\circ}19'15''$ S, $57^{\circ}53'55''$ W), a military Chilean Base, all-year operation. During austral winter its population reaches 21 people, and in summer 45.

La Paloma (LP 2015-2016): 6 km south-east of BO ($63^{\circ}21'20''$ S, $57^{\circ}48'21''$ W, 409 masl). Due to LP is a pristine site with no nearby human settlements, it was considered a background site regarding BO for the purposes of this work.

Base Yelcho (BY 2018): ($64^{\circ}52'55''$ S, $63^{\circ}5'03''$ W), located on Doumer Island. BY is a Chilean scientific for a maximum capacity of 22 people and is only inhabited during the summer.

P4 2018: located 5 km from BY, was selected as a background site regarding BY for the purposes of this work, since is also a pristine site with no nearby human settlements.

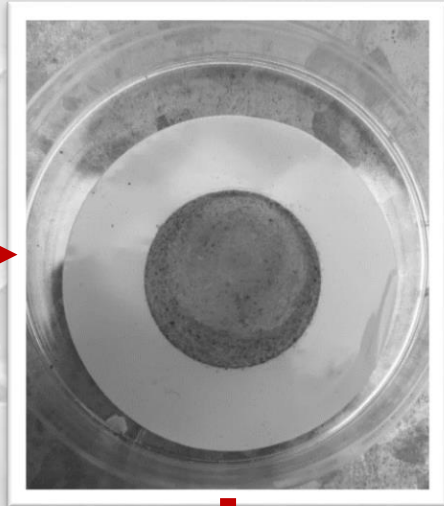


METHODS: SAMPLING PROCEDURE



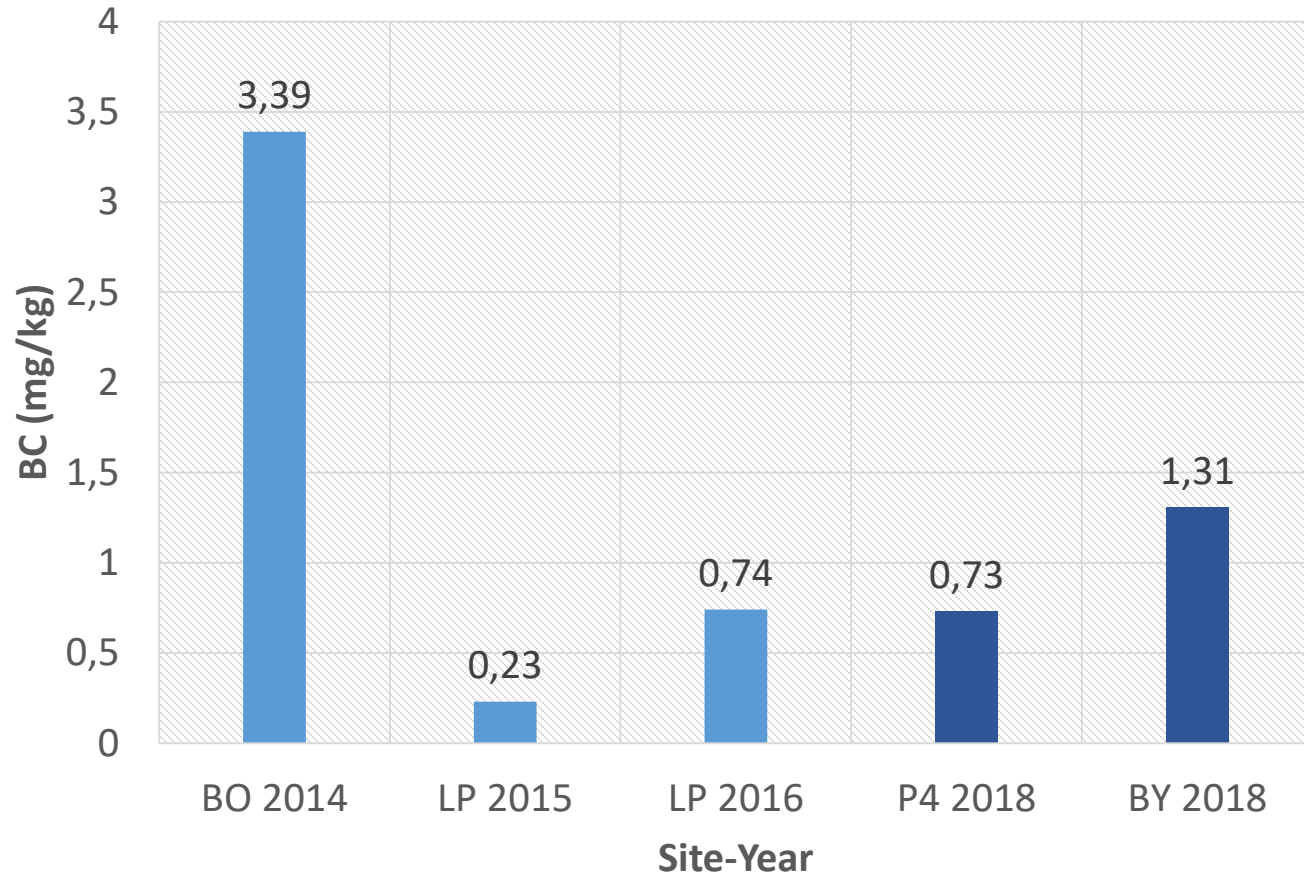
- Snow samples were collected in Whirl-Pak plastics bags (Nasco, USA).
- From an area of 1 m² and 5 cm thick layer, using a clean plastic shovel and disposable dust-free nitrile gloves.
- Sample weighed around 1200-1500 g, and they were kept always frozen (-20°C), during transport and storage, until they could be processed.
- All sampling material were washed using acid to avoid contamination

METHODS: DETERMINATION OF BC



- BC concentration in the snow samples was determined by using a novel methodology recently developed, published and patent by the authors (Cereceda et al 2019, <https://doi.org/10.1016/j.scitotenv.2019.133934>; US 16/690,013-Nov, 2019).
- Filter-based optical method where snow samples were microwave-assisted melted, then filtered through a special filtration system able to generate a uniform BC spot on Nuclepore 47 mm polycarbonate filters (Whatman, UK).
- BC deposited in filters was analyzed using a SootScan™, Model OT21 Optical Transmissometer (Magee Scientific, USA), where optical transmission was compared between the sample and a reference filter at a wavelength of 880 nm.
- The BC mass concentration was calculated using a 5-points calibration curve, previously prepared using real diesel BC soot as standard.

RESULTS



- BC concentration in snow from AP: $1.28 \pm 1.24 \text{ mg kg}^{-1}$.
- Snow from Base O'Higgins presented the highest BC concentration (3.39 mg kg^{-1}), followed by snow from Base Yelcho Base (1.31 mg kg^{-1}), La Paloma 2016 (0.74 mg kg^{-1}), P4 (0.73 mg kg^{-1}) and La Paloma 2015 (0.23 mg kg^{-1}).

CONCLUSIONS

- ❄ BC values observed in Antarctic snow were higher than others previously reported in the literature (Cereceda et al 2019) .
- ❄ BC values observed showed the influence that anthropic activities have in the study area, considering that the two highest values of BC concentration in snow were found at sites near the bases
- ❄ BC concentrations found in snow from the AP were comparable to those found in snowy sites in the Andes, continental Chile (Cereceda et al 2019).