50 Years Ago

Whether the United States Apollo programme will be delayed by the accident which killed the crew of the first spacecraft on January 27 is not yet known … The past few months have been plagued by a number of technical troubles. The device in which the fire took place a week ago consisted of two of the three components of the spacecraft intended for the Moon … Even so, it is by no means impossible that the National Aeronautics and Space Administration will be able to land a man on the Moon before 1970 — the original target … The next step in the programme, which need not be delayed by the accident a week ago, is to launch the Saturn V booster rocket … This test will provide valuable information about the rocket system and will also help to test the efficiency of the heat shields on the Apollo system.
From *Nature* 4 February 1967

100 Years Ago

The frequent references to the necessity of introducing the decimal system which one reads in the public Press at present suggest some considerations which an experience of more than two years with the B.E.F. [British Expeditionary Force] has confirmed. It is surprising with what facility the average soldier becomes accustomed to French money. Everything out here is bought and paid for on the decimal system. The men and officers receive their pay in French money … Here in France half a kilo is called a pound; a sou is called a halfpenny. There would be no need for us to change familiar names if we are lucky enough to adopt the decimal system … The present opportunity is one which ought not to be missed.
From *Nature* 1 February 1917

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This article was published online on 25 January 2017.

ECOLOGY

Vast peatlands found in the Congo Basin

The discovery of what is potentially the world's largest continuous tropical peat complex has great implications for global carbon stocks, land management and scientific investment in central Africa. SEE LETTER P.86

LOLA FATOYINBO

Southeast Asia's share of Earth's tropical peatlands was previously put at 56%[1], but the largest of the tropics' peatland complexes might in fact lie elsewhere. On page 86, Dargie *et al.*[2] combine satellite data with extensive field measurements of peat depth, carbon concentration and radiocarbon dating to produce a map of potential peat extent and carbon stocks in the Cuvette Centrale depression of the central Congo Basin. The authors propose that the Cuvette Centrale represents the world's largest tropical peatland complex, covering 145,500 square kilometres and possibly storing about 30 petagrams of carbon (1 Pg is 10^{15} grams) — the equivalent of 20 years of current US carbon emissions from fossil fuels.

Tropical peatlands have garnered increasing attention in recent years owing to their crucial role as terrestrial organic carbon reserves and the implications of peatland loss for climate change. Thick peat soils (ranging from 30 cm to up to 30 m)[3] form in areas where waterlogged soils create anoxic conditions that prevent organic materials such as dead leaves and wood from fully decomposing. The largest areas of peat are in temperate regions, but large areas of forested peatlands are also found in the tropics (Fig. 1).

Given the high concentration of carbon in peat soils and the overlying tropical forests, these areas can account for a substantial proportion of a country's total carbon stock, and their destruction can result in large carbon emissions. In 1997, for example, it was reported[4] that the equivalent of as much as 40% of annual global carbon emissions from fossil fuels was released to the atmosphere as a result of burning peat and the overlying tropical forest in Indonesia.

Despite the ecological role of tropical peatland areas, their depths and carbon stocks are poorly accounted for. This is mainly due to the logistical challenges that come with working in peatlands — the sites are almost always remote and covered by water, which makes surveying and sampling difficult. Remote sensing using optical satellite data is challenging, because tropical peatlands are often under persistent cloud cover. Optical remote sensing can be used to detect standing water, an indicator of the presence of peat, but in the tropics is often limited by the presence of dense forest canopies.

Dargie and colleagues overcame these challenges by combining their field sampling with an appropriate suite of satellite data to create a map of the potential peat extent in the Cuvette Centrale. They used satellite imagery from a synthetic aperture radar instrument to estimate water extent; optical imagery to classify areas of likely swamp vegetation; and a radar-derived digital model of terrain elevation to eliminate areas that have terrain slopes and can therefore be ruled out as peatland areas. Because radar instruments can 'see' through clouds, rainfall and leaves, water-inundated areas underneath the forest canopy can be identified. The authors also benefited from the opening of satellite-data archives and advanced computing capabilities, which allow the production of cloud-free mosaics of even the cloudiest areas on Earth, such as the Congo Basin[5–7].

The researchers estimated the current extent of peatlands in the Cuvette Centrale to be more than five times larger than previous estimates[1]. This increases the global extent and carbon stocks of tropical peatlands by 29% and 36%, respectively, and raises the Democratic Republic of the Congo and the Republic of Congo's rankings[1] to the second and third most important peatland countries in the tropics, respectively, in terms of carbon stocks. Forested peatlands have high carbon stocks and are extremely vulnerable to logging and changes in regional climate,

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KEMAL JUFRI/GREENPEACE

Figure 1 | Tropical peatland swamp in Sumatra. Southeast Asia was thought to contain 56% of the world's tropical peatland complexes[1]. Dargie *et al.*[2] now propose that the Congo Basin hosts the world's largest continuous tropical peat complex.

making them a prime candidate for climate-change reduction initiatives such as REDD+ (Reducing Emissions from Deforestation and Forest Degradation) and the Voluntary Carbon Market. As such, Dargie and co-workers' findings might enable the Republic of Congo and Democratic Republic of the Congo to generate revenue from carbon credits and stimulate future investments in science and conservation.

In addition to carbon stocks, the rates of carbon accumulation and their variation over time are key factors for those studying peat and carbon cycles, because they provide insight into the past conditions and processes that created peat soils. Dargie *et al.* used radiocarbon dating of soil cores to show that the Congo peatlands began accumulating about 10,600 years ago during the African Humid Period, a period of enhanced moisture availability across Africa that lasted until about 5,000–3,000 years ago. Furthermore, their results show that the Cuvette peat system is still actively accumulating carbon. However, the authors were not able to collect enough data to determine, using charcoal or pollen dating techniques, how peat-accumulation rates have responded to past climatic events, a contribution that would have helped scientists to better understand the peatland's vulnerability to current climate change.

Dargie and co-workers also concluded that, like other tropical peatlands, the Congo Basin wetlands are mainly rain-fed rather than river-fed. This means that any change in precipitation patterns, such as reduced rainfall or stronger seasonal effects, could alter wetland water levels and extent, potentially reducing the ability of these regions to store carbon as peat. Such changes are predicted to happen across equatorial regions as a result of climate change[8–10], which could result in the Cuvette Centrale switching from being a carbon sink to a source.

The most challenging aspect of the study was the collection of field data. The Cuvette region is remote, with no road access, so all measurements were taken in areas that were accessible by boat. Thus, although the collected data spanned a wide geographic area and consisted of many soil samples and vegetation measurements, they were still limited to the outer limits of one section of the proposed peatland area. The mapped extent of potential peatland is much more extensive than the sampled area, raising questions about whether all the potential areas really harbour peat, and, if so, how old and deep the deposits are. Therefore, the resulting carbon estimates still have a large uncertainty, which should be constrained with further study.

Several questions about the Cuvette Centrale wetlands must now be addressed. For example, to determine the contribution of this region to the global carbon cycle, methane emissions from these wetlands should be investigated and the Congo Basin's role as both a carbon sink and methane source[11] will need further evaluation. Nevertheless, Dargie *et al.* have taken the first essential step of showing that there are extensive peat deposits in the Congo Basin. They have also highlighted that we still do not have a sufficient understanding of the ecology, hydrology and climatology of Central Africa, even in the age of globalization and satellite monitoring. Let us hope that this study will inspire more investment in scientific research in Africa and improve our understanding of this historically understudied region. ■

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