

Opportunities for research in global changes in the field of chemistry

The recent publication of the Intergovernmental Panel for Climatic Changes report (*Painel Intergovernamental de Mudanças Climáticas*, IPCC, www.ipcc.ch) has not only made an enormous impact from the scientific point of view but has also had strong repercussions on society in general.

The unequivocal affirmation that global climatic changes are already causing alterations throughout various ecosystems, have raised the alert. It is virtually certain that these alterations are brought about by man's actions. An extensive set of scientific observations collected over the last five years form the basis of this new report by the IPCC.

The structure of advanced climatic models with a coupled carbon cycle have also contributed to affording greater confidence in future projections of the climate which predict a planet less friendly to its inhabitants all throughout this century. The governments and the society in general, have awakened to this clear and strong warning.

This new panorama has brought excellent opportunities for scientific research. The IPCC reports, for both Working Groups 1 and 2, at this moment is the best compilation of the science of global change. There is still much to be done concerning observations as well as in developing environmental models and strategies for mitigating emissions and the issue of adaptation to climatic change.

The report indicates that the average temperature of our planet has already risen 0.7 degrees centigrade over the last 100 years, with certain areas suffering an increase of more than 2 degrees centigrade, such as in certain areas of the Arctic.

The area covered by snow has been reduced by 7% over the last 50 years, altering the albedo of the surface over important areas of our planet. The occurrence of droughts, floods and extreme climatic events has risen over the last 30 years.

In particular, the increase in the occurrence of heat waves in Europe and hurricanes in the Atlantic tropics lead to observations that the climate is rapidly changing.

The average sea level has risen 17 centimeters (with important regional variability) as a result of thermal expansion and melting of the glaciers, Arctic ice and parts of the large amounts of water stored in Greenland.

The distribution of rainfall is being altered, increasing in temperate areas and decreasing in tropical ones. These observations of climatic change, already underway, have now a more robust and statistical significance. It has been analyzed by the IPCC with a confidence interval of 95%.

The IPCC has predicted a rise in the average temperature throughout this century of approximately 3 degrees centigrade, within a range of 2.0 to 4 degrees centigrade. Certain areas, such as the Amazon, may undergo a more pronounced rise in temperature of approximately 4-5 degrees throughout this century, with rainfall reduction, promoting greater occurrence of fires, bringing along a strong hydrological stress for Southern and Eastern Amazon areas.

The sea level rise will be significant and indicates the need to prepare mitigating actions in more vulnerable coastal areas of Brazil, specially the Northeast.

The Chemistry and its various disciplines can make essential contributions to the area of climatic change. Atmospheric Chemistry helps to understand the alterations in the methane oxidation rate as well as the ozone atmospheric half-life, two important greenhouse gases. Their concentration, lifetime and radiative forcing are controlled by OH and other gaseous precursors. The role of aerosols in the radiative atmospheric balance and the process of formation and development of clouds is an area in which we still have enormous uncertainties.

In aquatic chemistry, essential contributions can also be made towards adaptation and study of processes critical to the preservation of aquatic ecosystems, in both oceanic and continental waters. Global acidification of the oceans can alter important chemical processes in the maintenance of the oceanic food chain, with impacts on the fishing industry.

More efficient processes of biofuels production are strategic for Brazil's industry. In particular, the development of efficient bio-diesel production processes has important chemical applications. One major contribution to the necessary rational use of natural resources can be the improvement of the energy efficiency in practically all industrial processes. The latest developments in the area of global climate change may outline a future where society will use energy in a more efficient way, with higher efficiency and a more clever use of natural resources.

New strategic research is beginning to shine in practically all areas of knowledge, especially the multidisciplinary ones. Brazil has enormous strategic advantages on this new global change world scenario. We must use our advantages wisely for the sake of a more efficient country in the use of its vast and precious natural resources.

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