

Chapter 2

Applications of Geospatial Research in Earth Resources

Joyce Gosata Maphanyane
University of Botswana, Botswana

Read Brown Mthanganyika Mapeo
University of Botswana, Botswana

Modupe O. Akinola
University of Botswana, Botswana

ABSTRACT

This chapter is a continuation from Chapter 1. The two chapters draw attention to discussions on the Earth and its systems, which are driven by the outer motion of the Solar System. It gives an analytical view of what is known about the Universe. It elaborates upon the Earth's structure and the associated spheres and their interactions. These interactions account for activities that form the whole Earth dynamism, which manifest as tectonic movements, polar wandering and magnetic reversals, seasonal changes, hydrological cycle, atmospheric processes and life on Earth as a whole. The study of these is a fundamental component of geospatial science research.

INTRODUCTION

The electromagnetic waves are what determines that which is visible to us and what is blinded from us in the entire Universe. Everything we see is the result of light. The revolution in the understanding of the Cosmos; the way we know it today was triggered by a few great scientists. Nicolaus Copernicus in his book *De revolutionibus orbium coelestium* published a then radical hypothesis “that the Earth moved around the sun”. He proposed a heliocentric model of the solar system, which was up against three well-grounded beliefs which emanated from the religious tradition, the philosophical tradition and the then experience. These postulated that the Earth was a stationary sphere in the centre of the universe. In the 3rd BC Euclid, the Greek mathematician discovered that light travels in straight lines and that if its path could be changed the world could then be seen differently. In 1609, Galileo Galilei used the telescope

DOI: 10.4018/978-1-5225-3440-2.ch002

with lenses and his observations confirmed Copernicus' model of a heliocentric Solar System that refuted the basic principles of Ptolemean cosmology. William Herschel constructed a telescope with metallic lenses and in 1781 discovered the planet Uranus. He used stellar parallax to determine distances between two celestial objects as seen by an observer from two widely separated points. But this was limited and could not measure the totality of size the Universe. In 1964 the cosmic microwave were used to look back in time and recreate the *BIG BANG* from the oldest light. Einstein, Levite and Barnett work led to the calculation of Space in any Dimension, the 4D Space – non Euclidian Geometry; which explained the curved and wrapped Space that recognizes gravity and electromagnetic banding. Edwin Hubble in 1920 espoused the idea that the Space is expanding; that the fabric of Space is increasing. That led to the fact that once the *entire Universe was a point*, during the moment of creation – the *BIG BANG* at about 13.7 billion years ago.

WHAT IS KNOWN ABOUT THE UNIVERSE TODAY

Scientific facts about the Universe show that it was formed some 13.7 billion years ago after the *BIG BANG*, therefore, it is dynamic, complex, fiery, an extremely huge phenomena and still expanding. Table 1 summaries 15 known facts about the Universe.

Table 1. The Universe we know today

No	Known Facts about The Universe, Galaxies, Milky Way, and the Earth	Additional Notes
1	The Big Bang Theory	
	The <i>BIG BANG Theory</i> is the widely accepted model to explain the formation of the Universe.	Hubble in 1920 espoused the idea that the Space is expanding: the fact that once the entire Universe was a point; astronomer Georges Lemaître then proposed the <i>BIG Bang Theory</i>
2	The Age of the Universe	
	The <i>Big Bang</i> - birth of the universe was roughly 13.7 billion years ago	The epoch of reionization came about <i>400 million</i> years after the <i>Big Bang</i> , this was the end of the <i>cosmic dark ages</i> , and the birth of <i>galaxies</i> , and <i>stars</i> <i>The Sun</i> is <i>5 billion</i> years old <i>Earth</i> is <i>4.6 billion</i> years old
3	The Cosmic Microwave	
	Scientists analyse the <i>cosmic microwave background</i> (CMB) images to peer back to the <i>BIG BANG</i> and study the beginning of the Universe	Captured mainly by NASA's Wilkinson Microwave Anisotropy Probe (WMAP), which was launched in 2001
4	The Dark Matter.	
	Dark matter is pretty well-defined as some kind of material that has mass but doesn't interact with light, which is why we are having trouble seeing it," Since dark matter has mass, it is governed by gravity. So, while dark matter is invisible 23%. It is inferred based on the gravitational pull it exerts on regular matter 4%.	There is virtually no difference in the velocities of stars at the centre of a galaxy as those farther out. It goes against basic Newtonian physics, which implies that stars on the outskirts of a galaxy would orbit more slowly - <i>BIG-BANG-Theory-Universe-Today</i> .

continued on following page

15 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/applications-of-geospatial-research-in-earth-resources/187714

Related Content

Requirements for Model Server Enabled Collaborating on Building Information Models

Muhammad T. Shafiq, Jane Matthews and Stephen R. Lockley (2012). *International Journal of 3-D Information Modeling* (pp. 8-17).

www.irma-international.org/article/requirements-model-server-enabled-collaborating/75132

Mapping Accessibility to General Practitioners

Lars Brabyn and Paul Gower (2003). *Geographic Information Systems and Health Applications* (pp. 290-308).

www.irma-international.org/chapter/mapping-accessibility-general-practitioners/18848

Diagnostic Modeling of Digital Systems with Multi-Level Decision Diagrams

Raimund Ubar, Jaan Raik, Artur Jutman and Maksim Jenihhin (2013). *Geographic Information Systems: Concepts, Methodologies, Tools, and Applications* (pp. 407-433).

www.irma-international.org/chapter/diagnostic-modeling-digital-systems-multi/70453

A Study of Cross-Market Branch Banking in Illinois: A Multiple Regression Quadratic Assignment Procedure Approach

Bin Zhou (2016). *International Journal of Applied Geospatial Research* (pp. 1-15).

www.irma-international.org/article/a-study-of-cross-market-branch-banking-in-illinois/143073

Similarities between Competitors and the Implications for Location Strategies

Lawrence Joseph (2012). *Geospatial Technologies and Advancing Geographic Decision Making: Issues and Trends* (pp. 132-150).

www.irma-international.org/chapter/similarities-between-competitors-implications-location/63601