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Influence of Atmospheric Parameters on Global System Mobile Communication (GSM) Outgoing Calls Quality in Mubi Adamawa State Nigeria

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Abstract: This study aimed at investigating the influence of atmospheric parameters on GSM outgoing calls quality. Total of 132 calls were made from the month of December 2007 to November 2008. The atmospheric parameters viz rain fall affect GSM outgoing call quality with minimum average of 29.28% in July 2008 and maximum average of 53.73% in August 2008, dusty whether with minimum average of 28.40% in December 2007 and maximum average of 34.73% in the February 2008. The study shows that atmospheric parameters have great impact on GSM outgoing calls quality.

Key words: Outgoing call quality, atmospheric parameters, call angle information, GSM, density and materials

INTRODUCTION

Mubi region has tropical wet and dry type of climate (Rainy and dry season) coded as AW in Koppen's classification. Data on major climatic elements in Mubi town are not readily available as there is no standard, functioning weather station in the region. Rainfall in Mubi town like any other parts of Nigeria is controlled by the mass movement of the Inter Tropical Discontinuity (ITD) this is dividing the zone between the cool and dusty air mass Hamatan and the warm and wet air mass, the movement of the ITD determines the onset and cessation of rains and the weather conditions at a particular time of the year (Adebayo, 2004). In months of November to April there is hardly any rainfall influence during the period. In the months of December to February, the atmosphere is dusty (the air mass is dusty), March and April are the months of transition between dry and wet season in Mubi. Month of May to October constitutes the wet season; the mean onset dates of rainfall (i.e., beginning of growing season) ranges from 10-20th May, while (end of growing season) spans from 16th September to 25th October (Adebayo, 2004).

There are also some factors that affects GSM outgoing call quality such as free space loss commonly known as path loss, fresnel zone clearance and antenna gain (Hall, 1996; Frank, 2001).

This research looks into consideration the impact of the varying whether densities on GSM outgoing call quality since the atmosphere consist of numerous gases and water vapour each of varying densities depending on the whether factor, this study had identify that these atmospheric materials can slowdown the GSM outgoing call quality to a reasonable extend.

MATERIALS AND METHODS

The data were collected by the average of 15 calls made in a month throughout the year at any part of the town. The calls made used NOKIA handsets; NOKIA 1200 type RH-99 and NOKIA 1650 type RM-305 each with SIM card of the major three GSM operators in Mubi town. Average of 15 calls were made when the atmosphere is dusty in the months of December 2007 to February 2008, average 15 calls were made in the months of March and April when the atmosphere is clear or contents less impurity also 15 average calls were made in rainfall from the Month of May to October 2008. The data gathered for the assessment include call hold successful when the atmosphere is dusty, call hold successful under conducive whether condition and call hold successful under the influence of rainfall.

Data analysis: The data were collected when the atmosphere was dusty, under conducive whether and the influence of rainfall. In the investigation total of 132 calls were made altogether round the town with total of 33 calls in dusty whether, 33 calls when the atmosphere is clear and 66 calls under the influence of rainfall (precipitation). This data were then transferred into call angle information using Eq. 1 given by:

$$\alpha = 24n \quad (1)$$

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Where:

α = The angle of call made in every month for the outgoing call quality

n = The number of call hold successful in a month

Expression of Eq. 1 is derive from Eq. 2 given by:

$$\alpha = \frac{360n}{N} \quad (2)$$

where, N is the number of all calls in a month (call hold successful and call attempted) (Adu, 2004). The call angle information is further modify to determine the GSM outgoing call quality in percentage as shown in Table 1 given by:

$$Q_c(\%) = \frac{\alpha}{\beta} \quad (3)$$

Where:

Q_c = The GSM outgoing call quality measured in percentage

β = The call angle information in a month measured in degree (Emagbetere, 2007)

RESULTS AND DISCUSSION

For Operator A, in the month of December 2007, January and February 2008 when the atmosphere was dusty the outgoing call quality decay by 53.33, 60 and 46.69%, respectively, in the month of March 2008 the outgoing call quality rose by 6.67% from February 2008 continuous to grow through April and May 2008 by 13.33%.

The outgoing call quality decay again from the month of June 2008 by 26.66% further decay by 6.67% in July 2008 and 13.33% in August 2008 during rainfall, the outgoing call quality rose slightly by 6.66% in the month of September 2008 and then it continuous to rose appreciably in the month of October and November 2008 when rainfall sets out. For Operator B, in the month of April 2008 seems to have the highest outgoing call quality with 73.33% followed by the months of May, November and March 2008 during this time atmosphere density seems to be lighter no much content of water vapour and other parameters. The outgoing call quality in the month of July and August 2008 seem to be reduced by 26.67 and 13.13%, respectively during rainfall, while in the month of December 2007, January and February 2008, the outgoing call quality improved slightly with the average of 4.2% when the atmosphere was dusty.

For Operator C, in the months of December 2007, January and February 2008 the outgoing call quality seems to be the same at 40%, from March 2008 the call quality rose by 26.67% and further rose again by 6.66% in the month of April and May 2008. From July to September 2008 during heavy rainfall the outgoing call quality significantly decay by reasonable percentage, while in October to November 2008 the outgoing call quality appreciated when the rainy season set out.

In general, the months of March, April, October, November 2008 and December 2007, the outgoing call quality was the best when the atmosphere was clear or almost clear. In the month of June to September 2008 have the worst outgoing call quality when rainfall was at its peak which has about an average of 164.6 mm. Therefore, this study shows that atmospheric parameters have pronounce effect on GSM outgoing call quality since the density of the atmosphere varies with atmospheric parameters or factors.

Figure 1 shows that outgoing call quality of Operator A through the year is the best under all atmospheric condition followed by Operator C and B is the least.

Table 2 described the range of annual rainfall (mm) in Mubi. The month of August is highest with 238.7 mm followed by July, 222.6 mm, September, 209.2 mm June 142.1 mm, May 112.4 mm and October 62.6 mm with the other months >2 mm. July, August and September

Table 1: GSM outgoing call quality

Months	Operator (A) α_1 (0)	Operator (B) α_2 (0)	Operator (C) α_3 (0)	Operator (A) α_1/β (%)	Operator (B) α_2/β (%)	Operator (C) α_3/β (%)
Dec. (2007)	168	144	120	46.67	40.00	40.00
Jan. (2008)	144	144	144	40.00	40.00	40.00
Feb. (2008)	192	168	144	53.33	46.67	40.00
Mar. (2008)	216	240	240	60.00	66.67	66.67
Apr. (2008)	264	264	264	73.73	73.73	73.73
May (2008)	264	240	264	73.73	66.67	73.73
Jun. (2008)	168	144	168	46.67	40.00	46.67
Jul. (2008)	144	96	120	40.00	26.67	33.33
Aug. (2008)	96	48	72	26.67	13.33	20.00
Sep. (2008)	120	144	120	33.33	40.00	33.33
Oct. (2008)	216	192	240	60.00	53.33	66.67
Nov. (2008)	240	240	192	66.67	66.67	53.33
Overall	186	172	174	51.73	47.81	48.96

Table 2: Mean monthly rainfall (mm) in Mubi

Months	Rainfall (mm)
Jan.	00.0
Feb.	00.0
Mar.	1.1
Apr.	1.3
May	112.4
Jun.	142.1
Jul.	222.6
Aug.	238.7
Sep.	209.2
Oct.	62.2
Nov.	00.0
Dec.	00.0

Adebayo (2004)

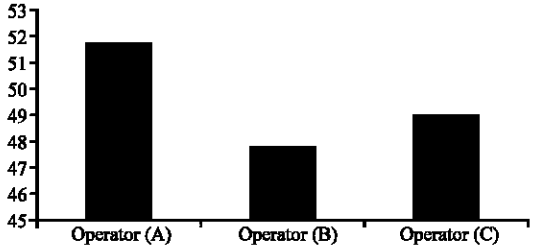

Fig. 1: Overall GSM outgoing call quality Operators

because of the heavy rainfall outgoing call quality is reduce by reasonable percentage as compared in Table 1.

CONCLUSION

This study aimed at investigating influence of atmospheric parameters on GSM outgoing call quality. An average of 15 calls were made in every month from December 2007 to November 2008, the study shows that rainfall affects GSM outgoing call quality more than the other atmospheric parameters considered in this study.

I believed that this study had revealed some technical content of GSM outgoing call services in Mubi that may need to be addressed up front to meet up with the customers' requirement throughout the year.

REFERENCES

Adebayo, A.A., 2004. Mubi Region a Geographical Synthesis. 1st Edn. Paraclete Publishers Ltd., Nigeria, pp: 32-37. ISBN: 978-8055-03-6.

Adu, D.B., 2004. Comprehensive Mathematics. 3rd Edn. A. Johnson Publishers Nigeria, pp: 234-235. ISBN: 978-2799-59-9.

Emagbetere, J.O. and F.O. Edeko, 2007. An evaluation of outgoing calls in Orghara Delta State. Res. J. Applied Sci., 2 (10): 1016-1018. http://www.medwell-online.org.

Frank, J.J., 2001. Fundamental elements of radio link engineering. Radio Eng., 12 (7): 203-213. http://www.radioengineering.it.

Hall, M.P.M., L.W. Barday and M. Hewilt, 1996. Propagation of radio waves. http://www.gsl.net.