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Co Concentrations at Two Urban Centers in Andhra Pradesh Namely Tirupathi and Visakhapatnam

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Abstract: ***Carbon monoxide is a very important air pollutant, it is a result of incomplete combustion of fossil fuels like coal, petrol and diesel from vehicles and industries result in the emission of Carbon monoxide. In this present paper the Carbon monoxide concentration as reported from the state pollution control board for two major cities Tirupathi and Visakhapatnam are collected for three months namely August, September and October and compared the march of hourly concentrations for these two stations was explained Scientifically based on the topography, meteorology and industrial concentrations and traffic flow. Such study for other centers will be useful did remark it the dominating factors in the concentration of Carbon monoxide at a later stage a model can be proposed to predict carbon monoxide concentrations as a function of industrial concentrations density of traffic and prevailing meteorology. In Visakhapatnam the reason to evening peak but there are undulate variations from morning to after noon which clearly shows that these concentration is not exactly by traffic but there is a significant concentration by industry also. Another reason is the cloudiness and drizzles are more frequent in Visakhapatnam than Tirupathi. In the month of October the temperature shows second peak and the southwest monsoon is completely retreated and is northeast monsoon as not setting. Temperatures being high there is large dispersion and instability. The concentrations at Visakhapatnam show much higher concentrations in this month.***
Keywords: Carbon monoxide, Industrial pollution, Meteorology and air pollution

I. INTRODUCTION

Carbon monoxide is a gas and is found in air. High levels of carbon monoxide are poisonous to humans and, unfortunately, it cannot be detected by humans as it has no taste or smell and cannot be seen. The natural concentration of carbon monoxide in air is around 0.2 parts per million (ppm), and that amount is not harmful to humans. Natural sources of carbon monoxide include volcanoes and bushfires. The main sources of additional carbon monoxide are motor vehicle exhaust and some industrial activities, such as making steel. Tobacco smoke is one of the main indoor sources of carbon monoxide. Carbon monoxide (CO) is a colorless, odorless, and tasteless gas that is slightly less dense than air. It is toxic to hemoglobin animals (both invertebrate and vertebrate, including humans) when encountered in concentrations above about 35 ppm, although it is also produced in normal animal metabolism in low quantities, and is thought to have some normal biological functions. In the atmosphere, it is spatially variable and short lived, having a role in the formation of ground-level ozone.

Carbon monoxide affects healthy and unhealthy people. Increased levels of carbon monoxide reduce the amount of oxygen carried by hemoglobin around the body in red blood cells. The result is that vital organs, such as the brain, nervous tissues and the heart, do not receive enough oxygen to work properly. No more than 2.5% of hemoglobin can be bound to carbon monoxide before some health effects become noticeable. At very high concentrations of carbon monoxide, up to 40% of the hemoglobin can be bound to carbon monoxide in this way. This level will almost certainly kill humans.

Consistently Visakhapatnam recorded higher concentration of Concentration is a result of a complete combustion of conventional fluence like coal, petrol, diesel and oil. The consumption of consistence fluence is high in Visakhapatnam because there are larger and medium scale industrials like coramandal (large), Hindustan petroleum refinery (large), Bharat heavy plates and vessels (BHEL), ACC cement plant at Pendurthi, Hindustan polymers (large scale) and many medium scale industries and pharmaceuticals. The vehicular traffic in Visakhapatnam is also large and Concentration comes from the exhaust of vehicles. However the sea breeze and land breeze in Visakhapatnam result in flushing action of the pollutant CO, which may reduce its concentration. Both Tirupathi and Visakhapatnam have a similar topoclimatology; both are surrounded by hill ranges. This may result in complex turbulent flow influenced by a natural topography.

For healthy people, the most likely impact of a small increase in the level of carbon monoxide is that they will have trouble concentrating. Some people might become a bit clumsy as their coordination is affected, and they could get tired more easily. People with heart problems are likely to suffer from more frequent and longer angina attacks, and they would be at greater risk of heart attack. Children and unborn babies are particularly at risk because they are smaller and their bodies are still growing and developing.

Carbon monoxide consists of one carbon atom and one oxygen atom, connected by a triple bond that consists of two covalent bonds as well as one dative covalent bond. It is the simplest oxocarbon and is isoelectronic with the cyanide anion, the nitrosonium cation and molecular nitrogen. In coordination complexes the carbon monoxide ligand is called carbonyl.

A. Sources of Carbon monoxide

Carbon monoxide is produced from the partial oxidation of carbon-containing compounds; it forms when there is not enough oxygen to produce carbon dioxide (CO_2), such as when operating a stove or an internal combustion engine in an enclosed space. In the presence of oxygen, including atmospheric concentrations, carbon monoxide burns with a blue flame, producing carbon dioxide. Coal gas, which was widely used before the 1960s for domestic lighting, cooking, and heating, had carbon monoxide as a significant fuel constituent. Some processes in modern technology, such as iron smelting, still produce carbon monoxide as a byproduct.

Worldwide, the largest source of carbon monoxide is natural in origin, due to photochemical reactions in the troposphere that generate about 5×10^{12} kilograms per year. Other natural sources of CO include volcanoes, forest fires, and other forms of combustion. In biology, carbon monoxide is naturally produced by the action of heme oxygenize 1 and 2 on the heme from hemoglobin breakdown. This process produces a certain amount of carboxy hemoglobin in normal persons, even if they do not breathe any carbon monoxide. In many tissues, all three gases are known to act as anti-inflammatories, vasodilators, and promoters of neovascular growth. Clinical trials of small amounts of carbon monoxide as a drug are ongoing. Too much carbon monoxide causes carbon monoxide poisoning.

Polluted atmosphere generally are associated with man's Industrial and domestic activities. However, many of the major gaseous pollutants are also emitted by nature. CO is colorless, odorless and tasteless gas slightly lighter than air. It is considered a dangerous asphyxiate because it combines strongly with the hemoglobin of the blood and reduces the blood's ability to carry oxygen to cell tissues. Untold numbers of deaths have been caused by CO in coal mines, fires and closed places. A healthy working man can work 8 hours a day, 40 hours a week without noticeable adverse effects at 25ppm. Carbon Monoxide is product of incomplete combustion of carbon and its compound. It is emitted by fossil fuel combustion sources in greater quantities than all other pollutant sources combined. The automobile is by far the largest single pollution emission source.

Carbon monoxide (CO) is a pollutant that affects methane, carbon dioxide, and troposphere (lower atmospheric) ozone. It thus plays a role in both air pollution and climate change, and is therefore regulated in many parts of the world. CO is unique among pollutants in the lower atmosphere in that it lasts for roughly a month, long enough for it to be transported long distances but not so long that it becomes distributed nearly uniformly(By Drew Shindell — February 2007). As part of an effort to study future air quality and climate change, a team of researchers from ten countries recently used 26 state-of-the-art atmospheric chemistry models to simulate present-day and projected near-future CO. Any exposure to ambient air with CO levels greater than 100 ppm (White et al., 1992; Townsend and Maynard, 2002) is dangerous to human health (slight headache in 2e3 h and perceptible clinical admission needs with a 20 h exposure). Carbon monoxide exposure may lead to a significantly shorter life span due to myocardial injury occurs frequently in patients hospitalized for moderate to severe CO poisoning and is a significant predictor of mortality (Henry et al., 2006). In urban areas like metro cities, anthropogenic sources contribute far more to the concentration of CO than the natural sources. Earlier researchers (Kaneyasu et al., 2000; Bey et al., 2001; Liang et al., 2004) have reported that changes in meteorological conditions and long-range transport from the distant sources largely contributes to pollution. Liu et al. (2003) have shown the frequent episodes of high CO due to the passage of cold frontal systems, which sweep away the clean, marine air and bring CO directly from the nearby continent. Kaneyasu et al. (2000) reported the pollution events of sulfur dioxide, black carbon, and organic carbon over North Pacific due to the arrival of cold air with increased wind speeds from Asia. Liang et al. (2007) examined the convective transport role during summertime influence of Asian pollution in the free troposphere over North America. Sawa et al. (2007) observed that the widespread pollution events of carbon monoxide over western North Pacific due to the passages of cold fronts associated with the eastward migrating cyclones. Projections of the global average CO response to emissions changes in the year 2030 for three different scenarios are quite consistent among the models. Global average CO around the middle of the lower atmosphere increases by 16±4% for a high-emissions scenario, decreases by 11±3% for a low-emissions scenario, and changes by

2±2% for a mid-range scenario. Projected 2030 climate changes play a smaller role, decreasing the global average CO by 2±2%. Local changes can be much larger, however (By Drew Shindell — February 2007).

II. DATA AND METHODOLOGY

Data (Hourly and daily) has been collected from CPCB (Center for Pollution Control Board)http://cpcb.nic.in/newitems.php for the months of August, September and October for the year 2016 for two stations of Visakhapatnam and Tirupathi.

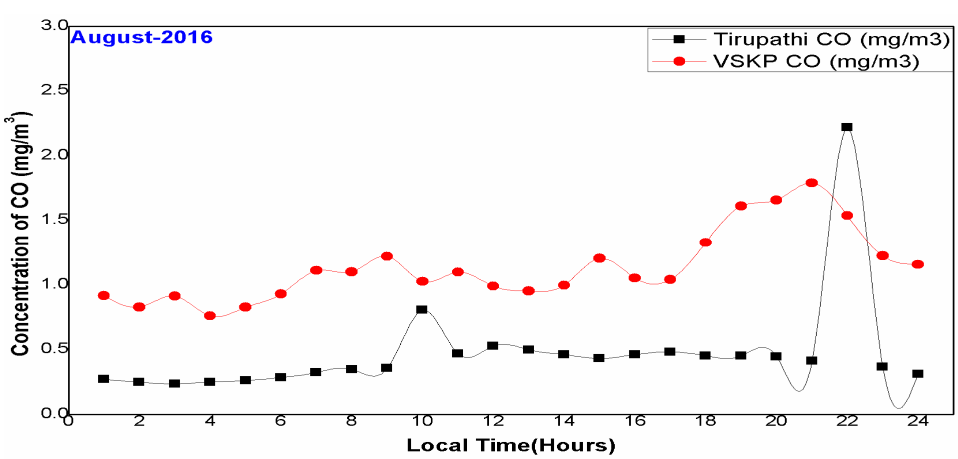
The regular monitoring of Carbon monoxide, Temperature, Relative Humidity and Solar Radiation is typically for every 15minutes, 30minutes are collected in August, September, and October. Infrared analyzer, infrared detectors separated by optical cell, flow meter, connecting tubes and pumps. Sampling station located at GVMC Ram Nagar-APPCB.

Sampling of Carbon monoxide in ambient air and determination of its concentration. Method of measurement is non-dispersive infrared absorption gas analyzer i.e., any electro optical spectrometer with no spectral dispersion component; the interference of carbon monoxide and water vapor can be restricted to less than one percent.

This location receives number of vehicular transport (road ways) and near to industrial area also. Generally it is kept at about 5 to 10m height from the ground level and sufficiently away from the disturbance or direct obstacle from the source under condition.

Fig: 1 (a-c) Concentration of CO over Visakhapatnam and Tirupathi from August-October in 2016

a)



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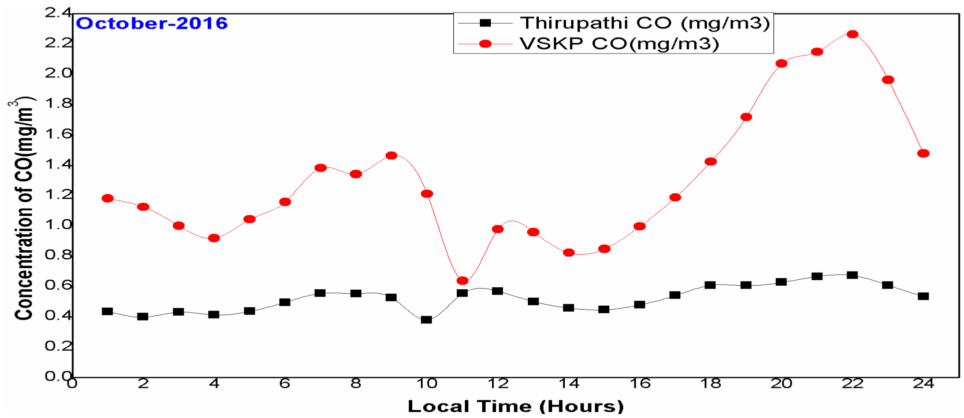

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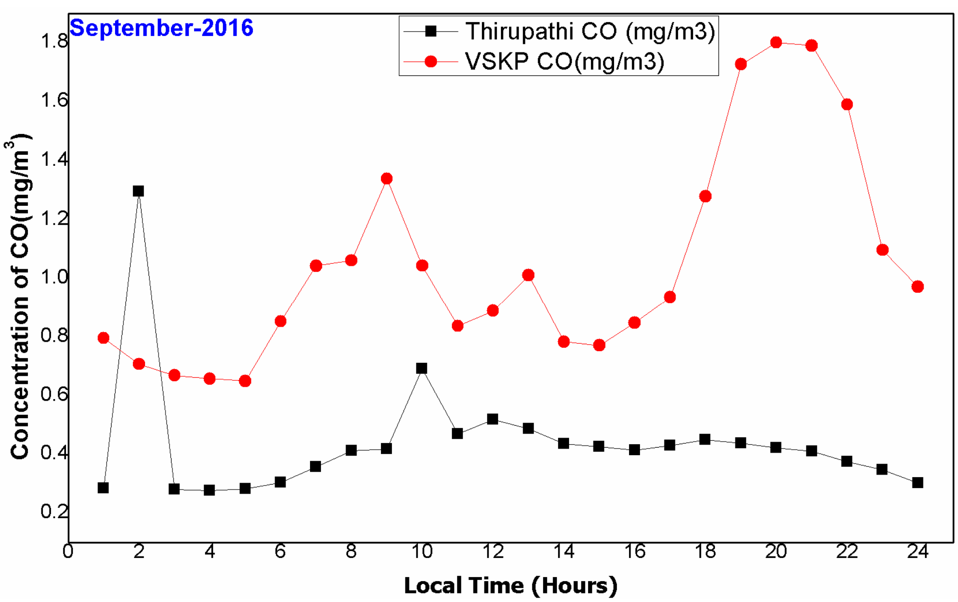
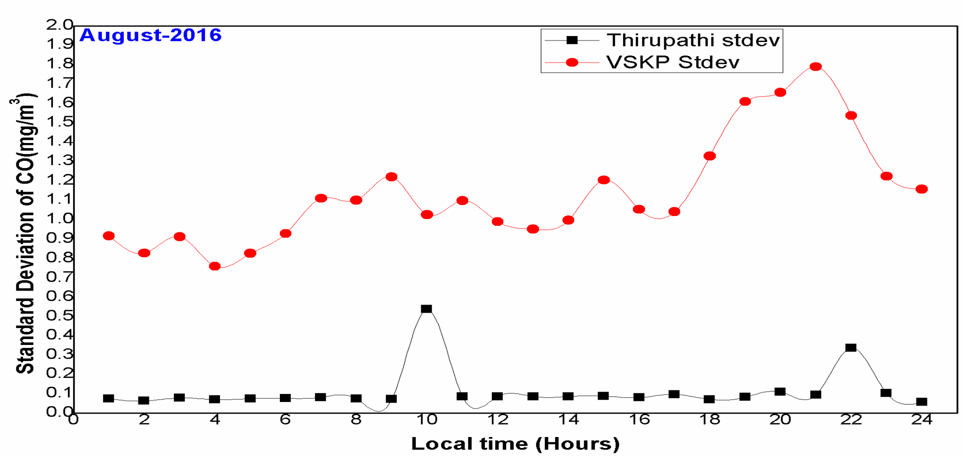


Fig: 2(a-c) Standard Deviation of CO over Visakhapatnam and Tirupathi from August-October in 2016

a)



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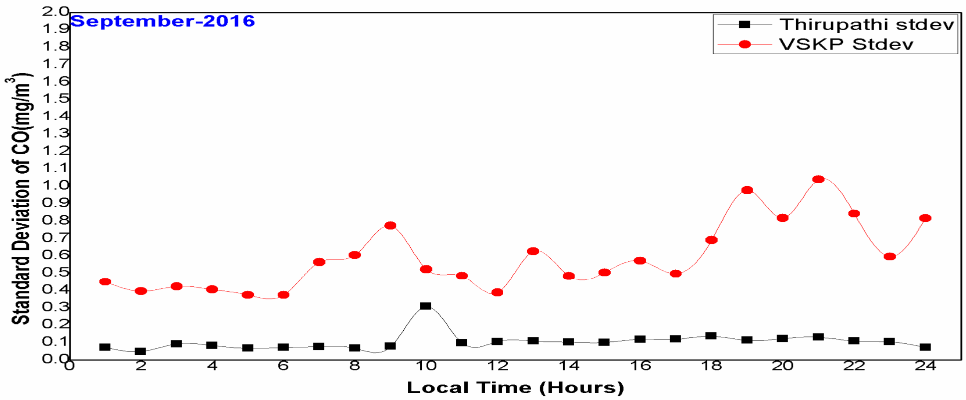
b)



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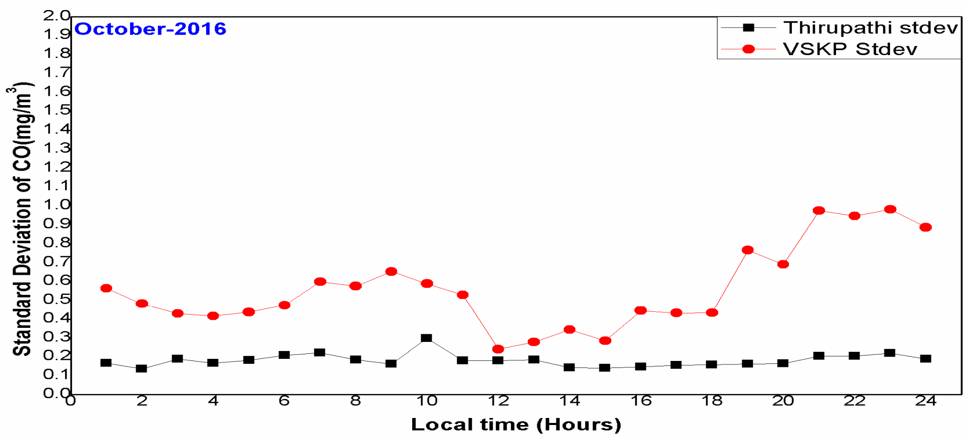
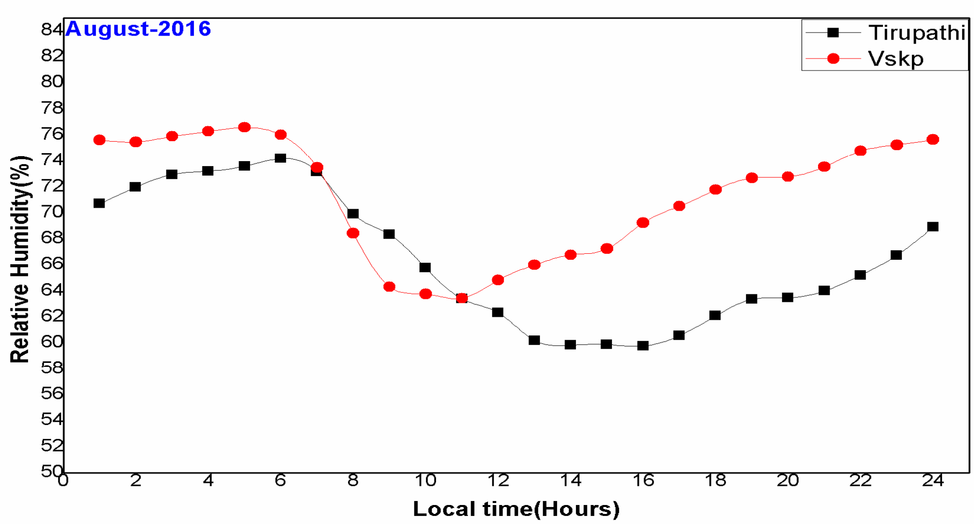


Fig: 3(a-c) Relative Humidity over Visakhapatnam and Tirupathi from August-October in 2016

a)



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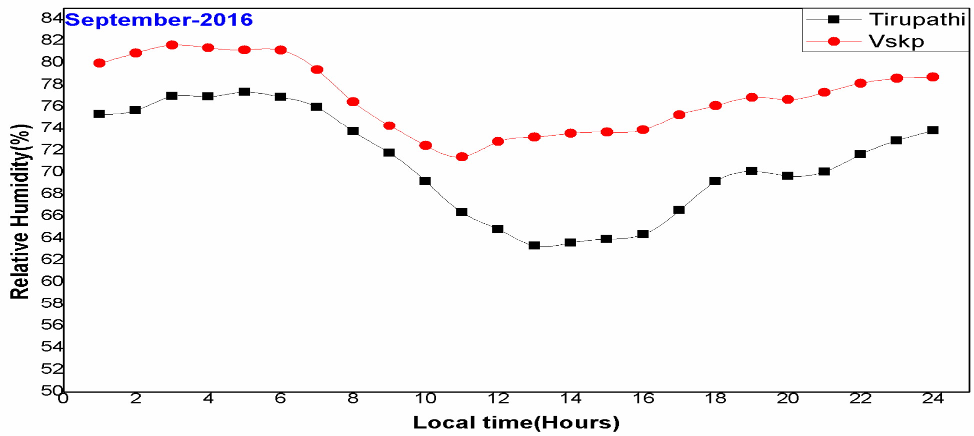

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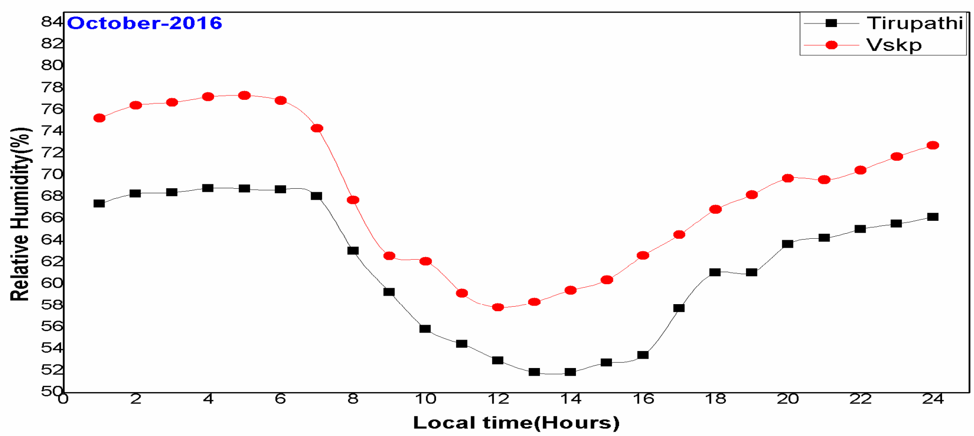
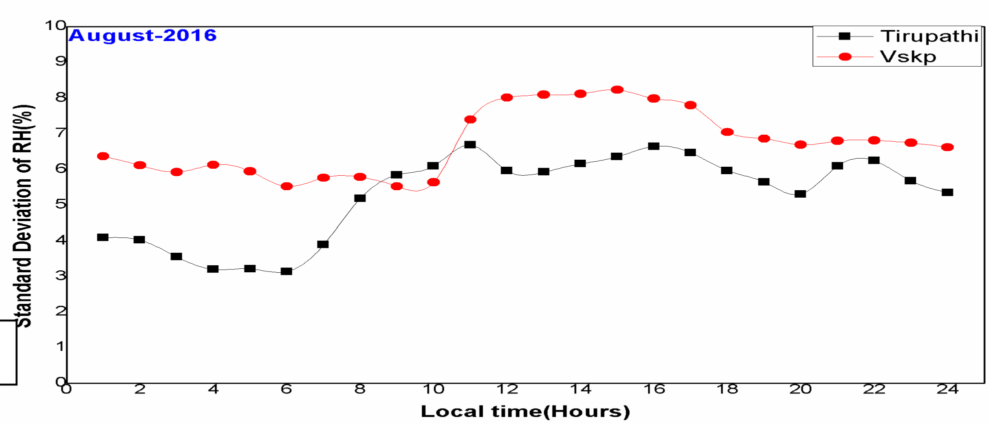
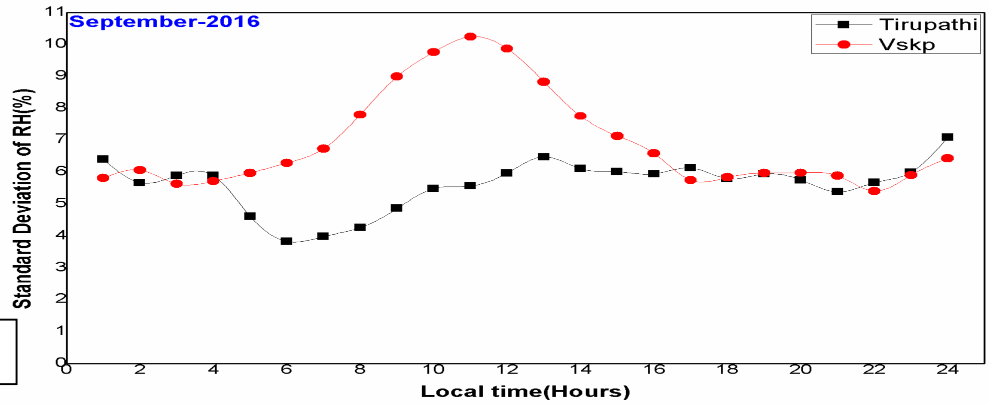


Fig: 4(a-c) Standard Deviation of RH over Visakhapatnam and Tirupathi from August-October in 2016

a)





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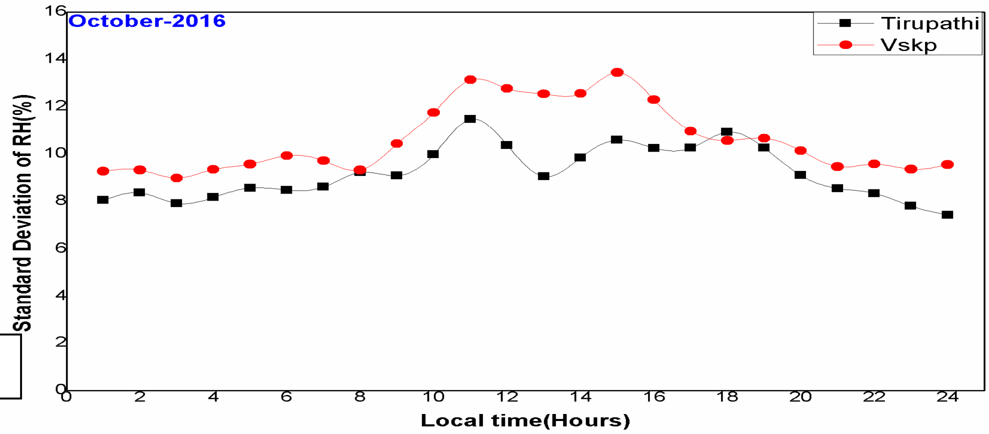
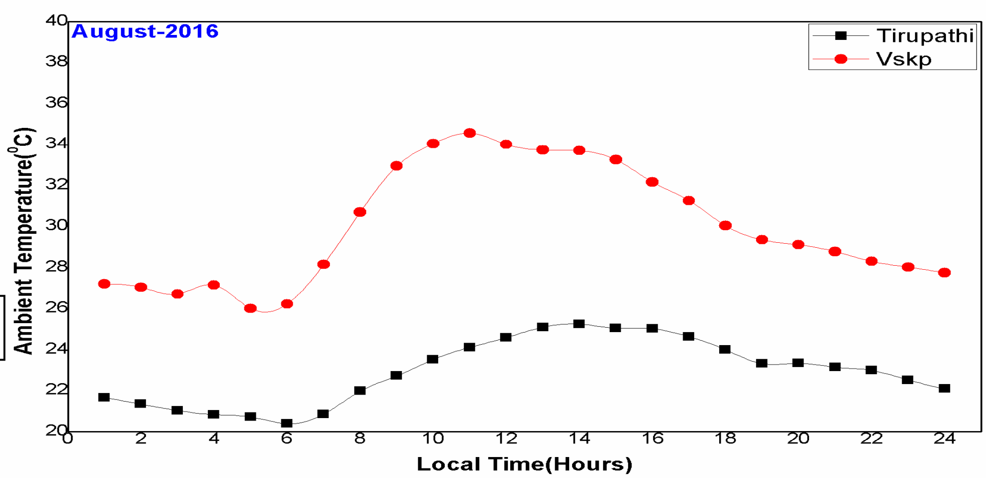
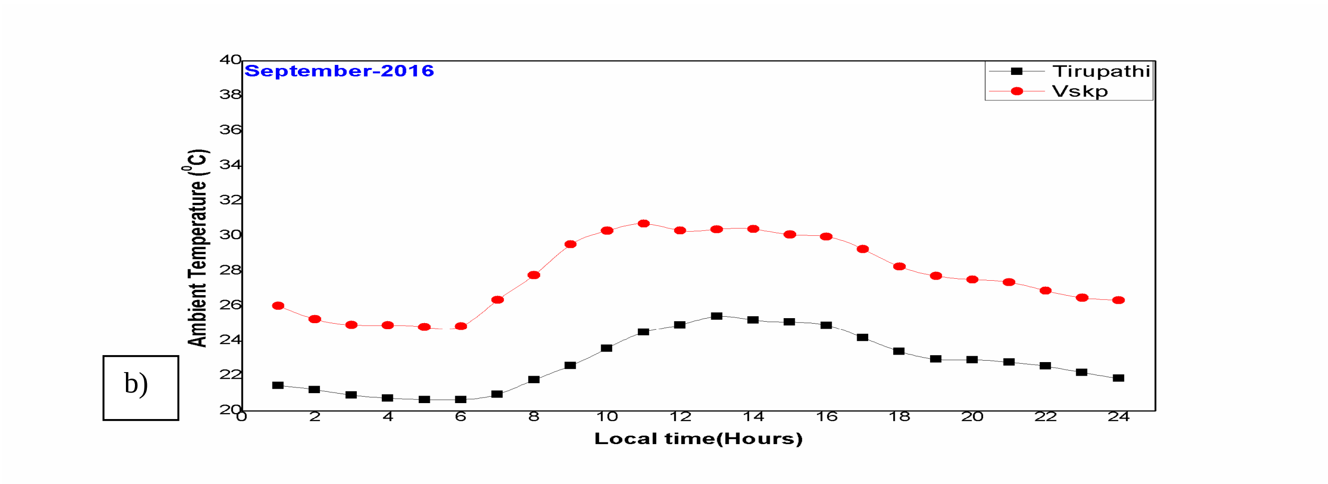


c)

Fig: 5 (a-c) Ambient Air Temperatures over Visakhapatnam and Tirupathi from August-October in 2016



a)



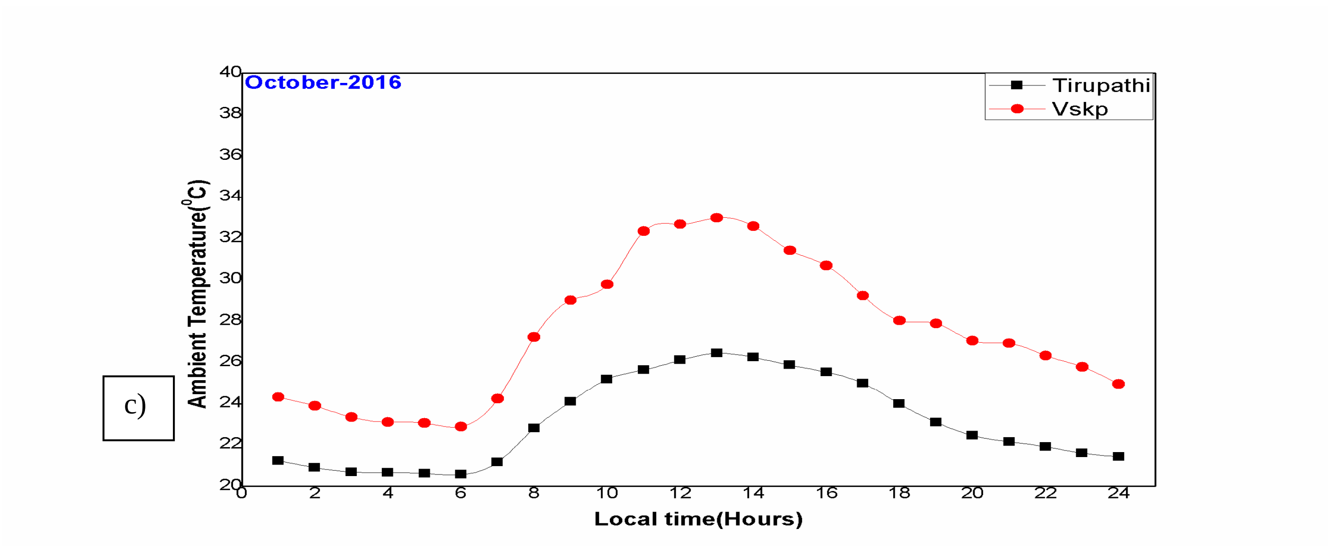
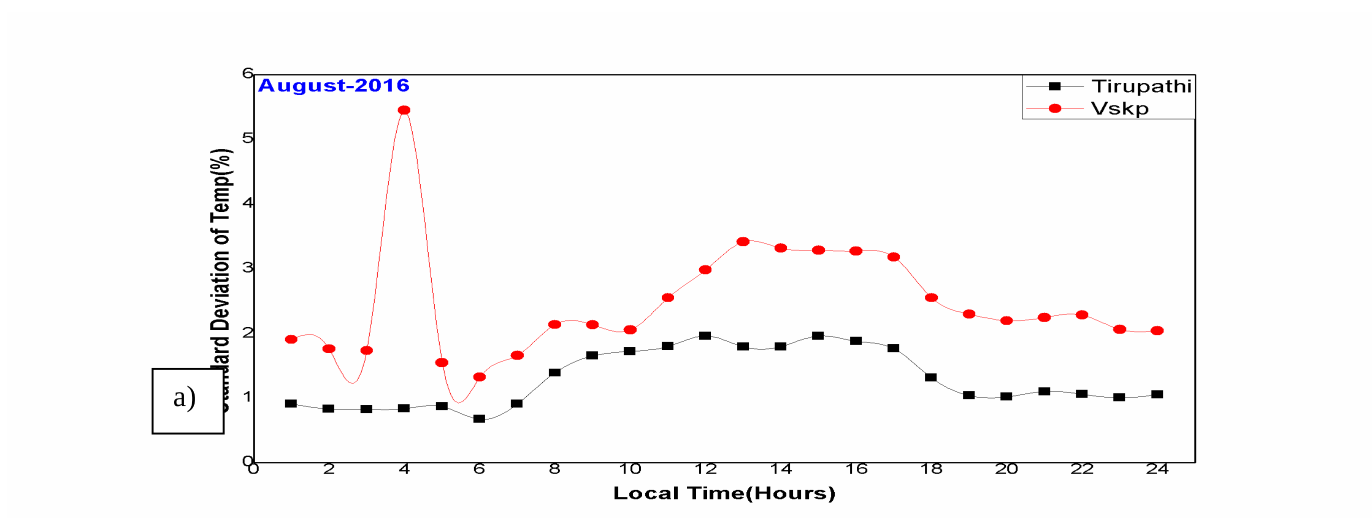
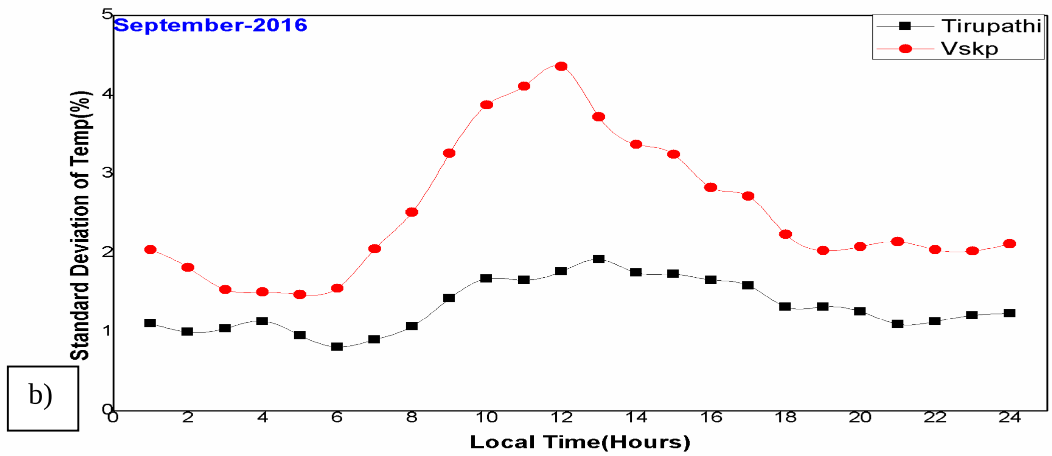


Fig:6(a-c)Standard Deviation of Temperature over Visakhapatnam and Tirupathi from August-October in 2016





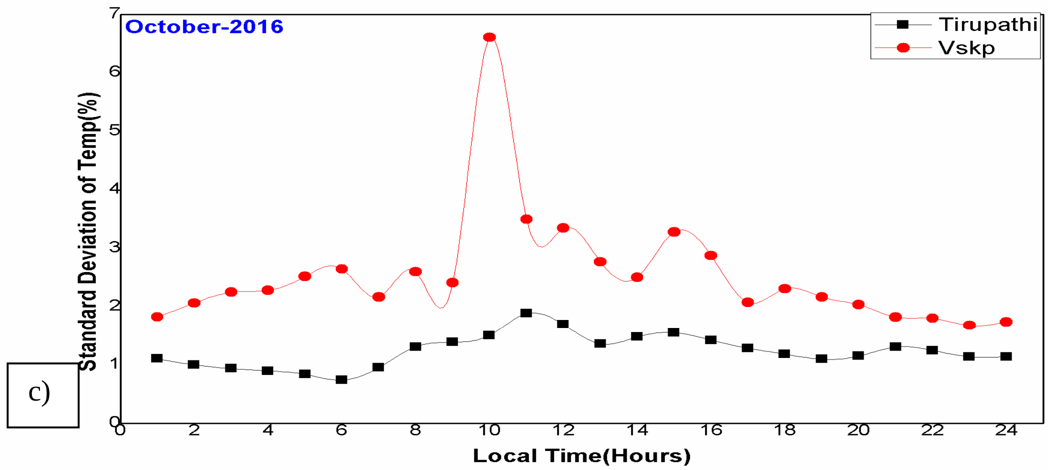
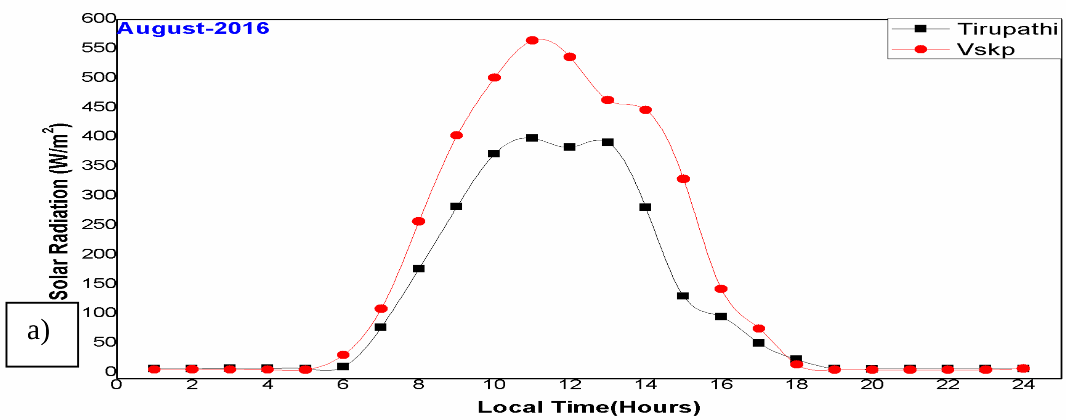
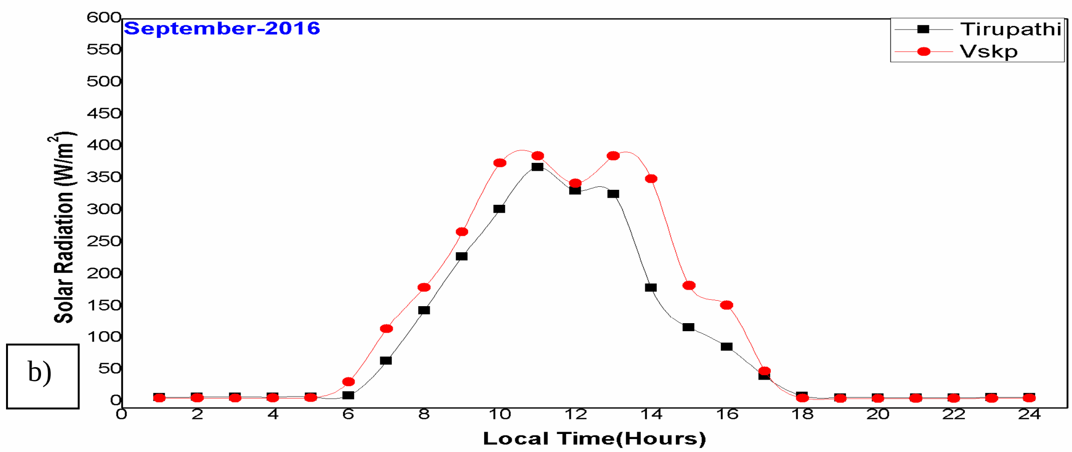


Fig: 7 (a-c) Solar Radiation over Visakhapatnam and Tirupathi from August-October in 2016





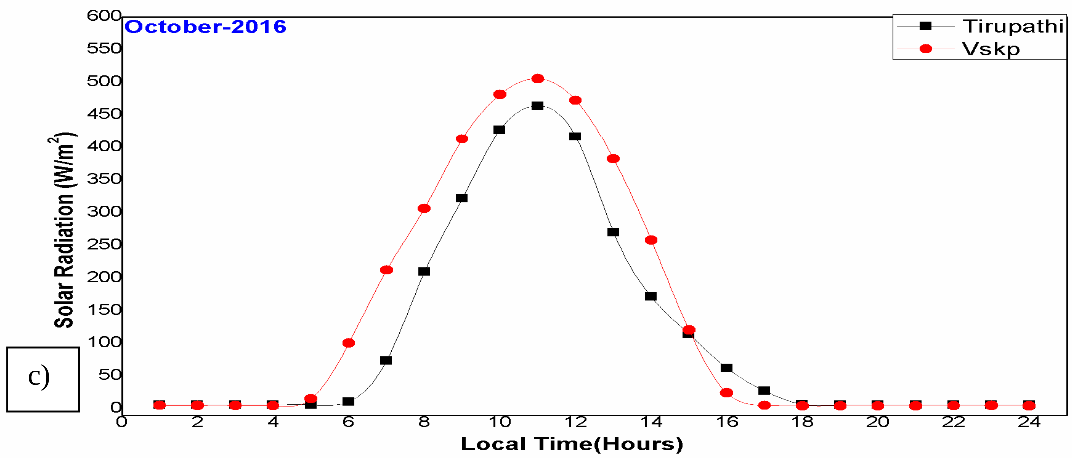
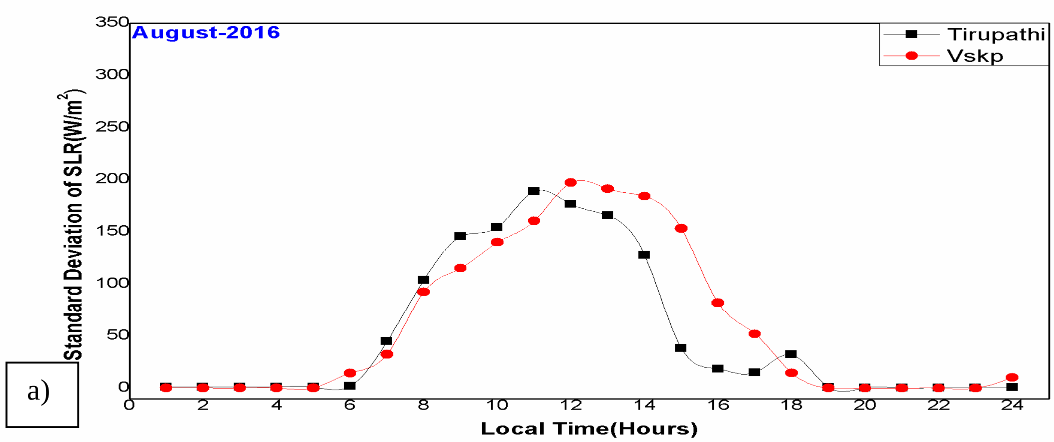
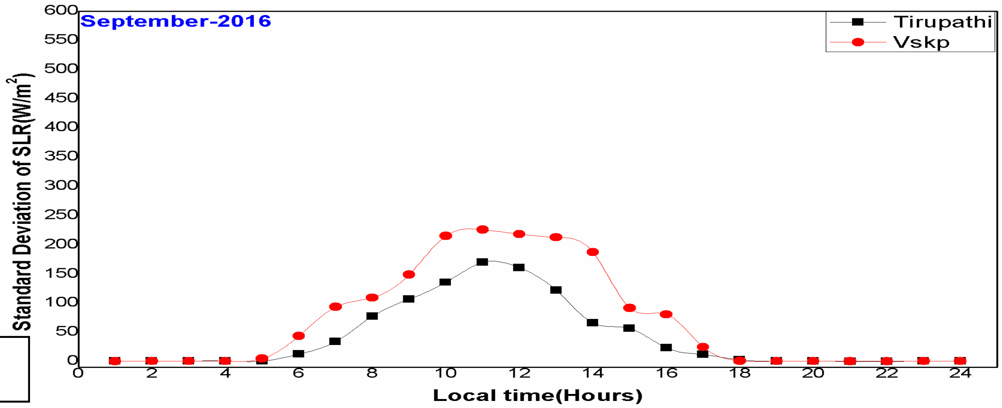


Fig: 8 (a-c)Standard Deviation of Solar Radiation over Visakhapatnam and Tirupathi from August-October in 2016





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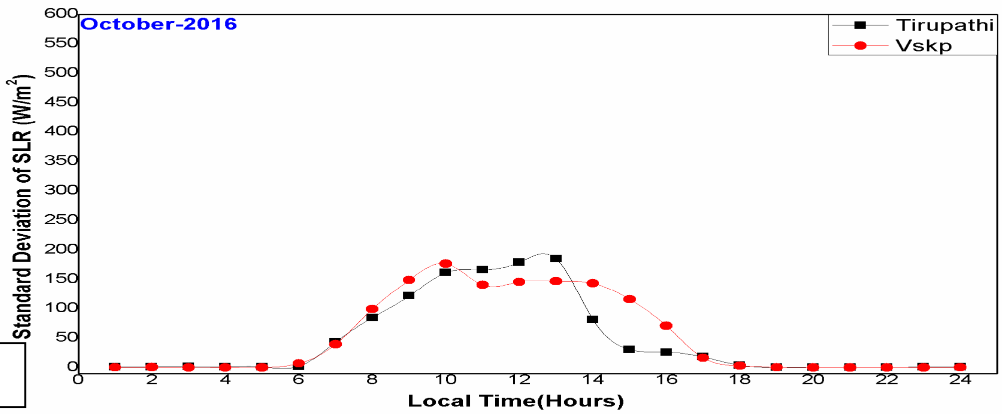

c)

III. RESULTS AND DISCUSSIONS

Generally in the month of August, the Carbon monoxide Concentration is high in Visakhapatnam compared to Tirupathi. However because of weather parameters resulting in cloudiness and precipitation in the month of August. This is a typical month of monsoon. There are slightly variations it is interested to note that in Tirupathi. The concentrations have two distinct peaks one is morning 9 to 11am and the other is in the evening 8.30 to 11pm. This clearly indicates that CO is mainly from the traffic following the peaks hours of traffic in the morning and evening. In Visakhapatnam the reason to evening peak but there are undulate variations from morning to after noon which clearly shows that these concentration is not exactly by traffic but there is a significant concentration by industry also. Another reason is the cloudiness and drizzles are more frequent in vizag than Tirupathi. There is clearly different pattern of Carbon monoxide in the month of September as for as Tirupathi is concern September results in southwest monsoon retreating there will be much rains and however it is interesting to note that the CO concentrations have a peak in the night time at 2am followed by a slow at to 10am there is a gradual decrease there on. This can be explaining with atmospheric stability. There is stable atmosphere which may result in higher concentrations of Carbon monoxide. However the 10am refers to the traffic peak. The evening absence of peak is mainly because of unstable atmosphere. However the concentration of Carbon monoxide in vizag shows clear peaks in morning and evening. This may be because of large quantum of traffic and flushing action is relatively less. However instead of 2 peaks there is another small peak at 1 noon this may be due to the industrial emissions coupled with complex terrain. The stability is more at the same time the dilution and dispersion is less resulting in higher concentration of Carbon monoxide. Such peak is absent in Visakhapatnam because such stable conditions (very strong stability) is absent in Visakhapatnam. In the month of October the temperature shows second peak and the southwest monsoon is completely retreated and is northeast monsoon as not setting. Temperatures being high there is large dispersion and instability. The CO concentrations in Tirupathi reflect this and in fact show a decrease at 10am. In other times the curve is more or less flat. The concentrations at Visakhapatnam show much higher concentrations in this month. The concentrations are high both in the morning and evening following the traffic pattern. However it is interesting to note that the lower peak is also distinghly at Visakhapatnam.

IV. SUMMERY AND CONCLUSSIONS

Generally in the month of August, the Carbon monoxide Concentration is high in Visakhapatnam compared to Tirupathi. However because of weather parameters resulting in cloudiness and precipitation in the month of August. Another reason is the cloudiness and drizzles are more frequent in vizag than Tirupathi. The evening absence of peak is mainly because of unstable atmosphere. However the concentration of Carbon monoxide in vizag shows clear peaks in morning and evening. This may be because of large quantum of traffic and flushing action is relatively less. In the month of October the temperature shows second peak and the southwest monsoon is completely retreated and is northeast monsoon as not setting. The concentrations are high both in the morning and evening following the traffic pattern. However it is interesting to note that the lower peak is also distinghly at Visakhapatnam.

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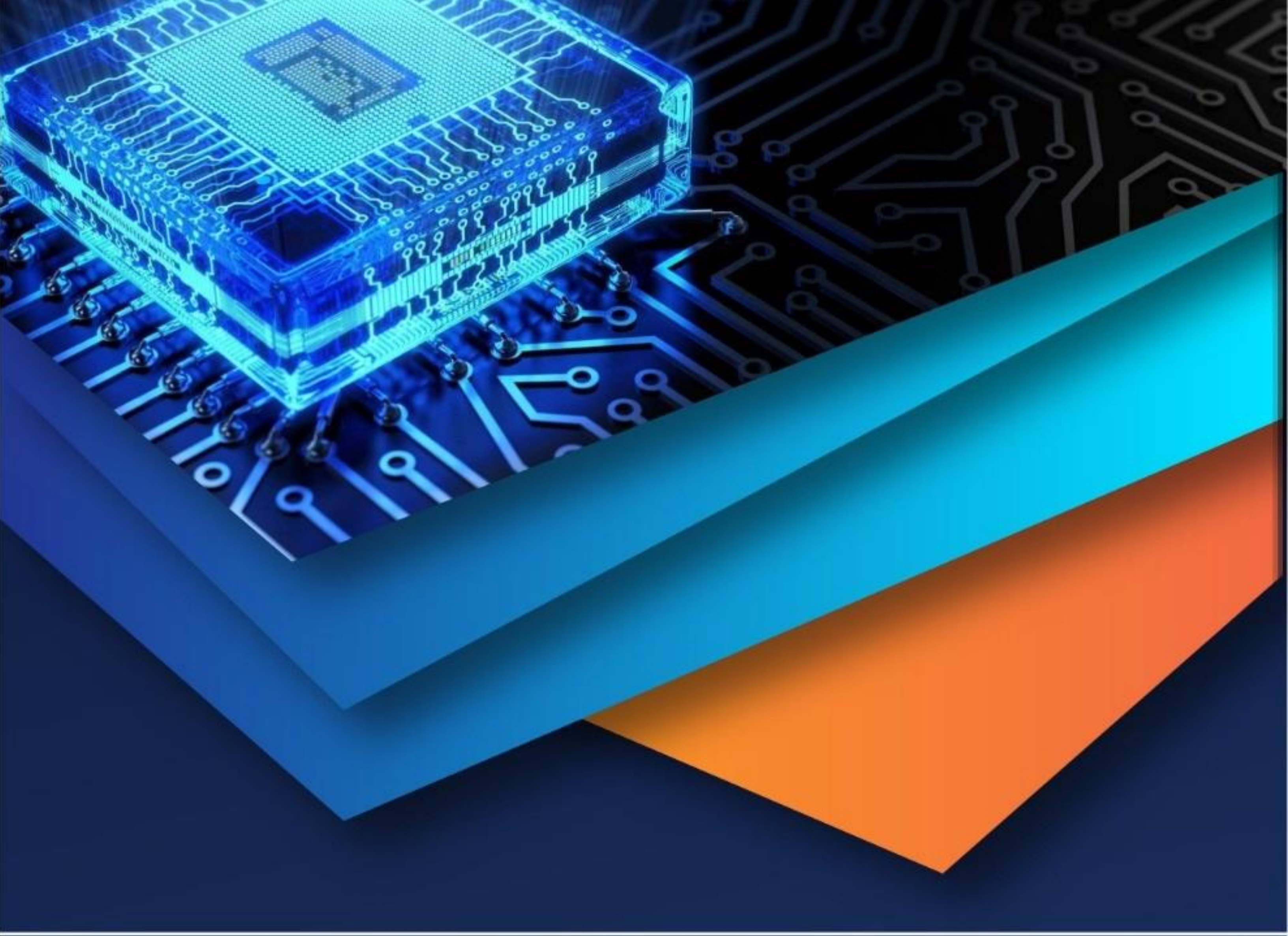

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