

Aurora



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The Royal Astronomical Society of Canada - Windsor Centre

May 2005

VENUS, EARTH AND MARS:

ATMOSPHERIC PRESSURE AND GREENHOUSE EFFECT COMPARISONS

by Bert Huneault

Planet Earth and its neighbours Venus and Mars are three very different worlds when it comes to atmospheric pressure and greenhouse effect.

In Canadian media, barometric pressure is usually stated in kilopascals (kPa), average pressure at sea level being 101.32 kPa. On weather maps however, meteorologists normally show pressure in hectopascals (hPa), also called millibars (mb). Since 1 kPa = 10 hPa, it follows that standard pressure at sea level is 1013.2 hPa; or 1013.2 mb.

Now, let's see how gaseous pressures compare on nearby Venus and Mars. The atmosphere on Venus is quite dense and consists mostly of carbon dioxide (CO₂), with small amounts of water vapour and nitrogen, resulting in a surface pressure of some 90,000 mb, i.e. roughly 90 times greater than on earth. The thick CO₂ atmosphere produces a runaway greenhouse effect, resulting in a remarkably hot surface temperature of 480°C.

Mars' atmosphere is also mostly CO₂, with only small amounts of other gases. Unlike Venus, however, the atmosphere on Mars is very thin and produces an average surface pressure of only about 7 mb, i.e. some 150 times lower than on earth. Mars' very thin atmosphere produces virtually no greenhouse effect. Consequently, heat escapes rapidly from the surface, resulting in a very cold average surface temperature of about -60°C.

Here on earth, we often hear about the greenhouse effect in connection with global warming. The media often make it sound like the greenhouse effect is a bad thing; but we should keep the following in mind:

Our atmospheric greenhouse effect occurs because water vapour, CO₂ and other greenhouse gases allow most of the sun's visible radiation to reach the surface, but they absorb a good portion of the earth's outgoing infrared (IR) radiation, preventing it from escaping into space. Some of the absorbed IR energy is re-radiated back downward, thus keeping the earth's surface and the lower atmosphere much warmer than they would be in the absence of those gases. It is the greenhouse effect, then, that keeps the temperature of our planet at a level where life can survive. So, the greenhouse effect is not just a good thing, it is essential to life on earth.

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Calendar of Events

Our next 'enlightened' meeting...

Tuesday, May 17, 2005 8:00 p.m.
at
K of C Maidstone Recreation Centre
10720 County Road 34 (Old Hiway 3) just
west of beautiful downtown
Maidstone (and the railway crossing)

Short Talk: Steve Mastellotto
A Pop Culture Look at Light Pollution

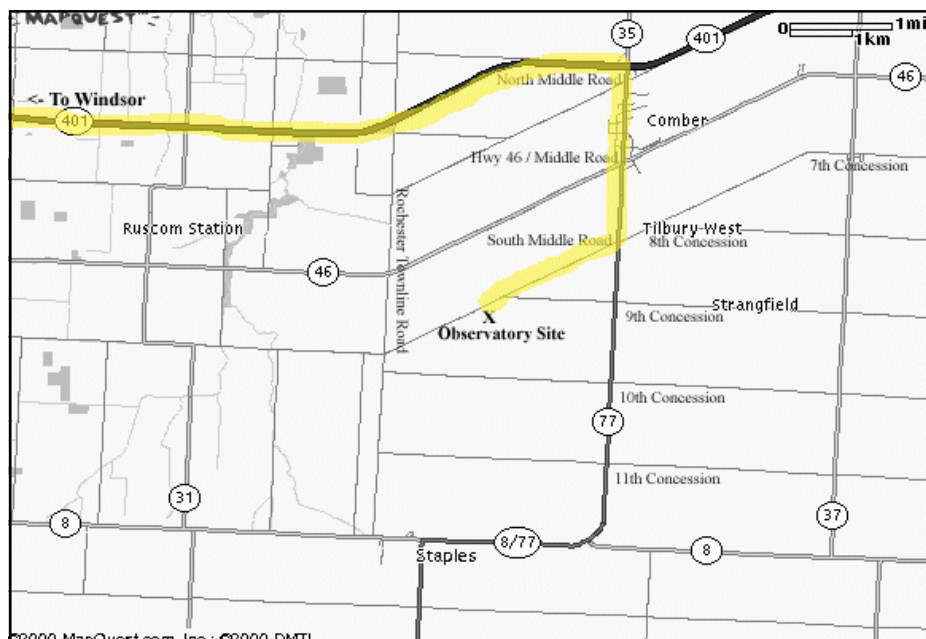
Main Talk: Dan Taylor
Light Pollution: What it has done to you and
what you can do to it.

Coming Events

Centre Observing Night/Open House:

April 16 8:30 p.m.
May 14 9:30 p.m.
June 11 9:45 p.m. (plus Annual Picnic)

April 24 :Earth/Astronomy Day 2005 - Ojibway Park
May 4-6 :Eta Aquarid meteor shower/drizzle
*May 8 :Ceres at opposition - mag7.0 -
view w/binoculars*
May 14 :Lake Hudson Star Party (Jackson, Mi)
May 15 :Earliest launch of Shuttle 'Discovery'
May 20-23 :General Assembly 2005 - Kelowna BC
May 24 :Moon occults Antares
June 7th :Council Meeting



Hallam Observatory Site

At left is a map showing the Comber area and it includes the major highways (401, 77, 8 and 46) that are in the area of the observatory. I "highlighted" the most direct route from Windsor on this map which is to take 401 East to Highway 77 South to South Middle Road. While on South Middle Road you will cross an old railway right of way and just after the barely discernable point where Concession 9 joins it you will find the observatory site on the South side of the road. If you hit the Rochester Townline Road (i.e. you come to a stop sign and have to turn left or right) you have gone too far. On most clear nights someone is usually out there observing but if it happens to be a clear, moonless, weekend night you should have many observing buddies.

Submissions

Aurora is published monthly except for August. The September, November, January, March, May and July issues are full newsletters (usually 6 pages) with a number of member submitted articles. The October, December, February, April and June issues are short flyers (2 pages) with one short article. Submitted articles can be of any length from a paragraph to multiple pages. I can scan pictures and/or diagrams (both prints and film) to support your article and the originals will be returned to you.

Submission deadline is the 1st of the month. I will accept Emails at the address below, floppy disks, CD's, or written submissions.

Editor: Ken Garber Email: kgarber@cogeco.ca
Ass't: Dan Anzovino Email: danzovino@sympatico.ca

Membership

The Windsor Centre of The Royal Astronomical Society of Canada meets on the 3rd Tuesday of every month (except July and August) at the K of C Maidstone Recreation Centre. In addition to regular meetings the centre hosts a number of observing nights, a picnic and a December social. Members receive a copy of the Observer's Handbook, the RASC Journal, a subscription to SkyNews magazine and access to the Centre's library and telescopes.

Annual Membership Fees are Regular - \$50.00, Youth - \$31.25 and Life - \$1000.00.

Contact Ken Garber at (519) 966-3478 or visit our website at: www.mnsi.net/~rasc for more information.

Minutes of the March 15th meeting - recorded by Dave Panton

President, Steve Mastellotto: Steve asked members present to read the minutes from the February meeting. A motion to accept the minutes from the February meeting was made by Felice Des-Marais, seconded by George Marshall and carried.

Reports

Correspondence Secretary, Joady Ulrich: Joady was unable to attend the meeting.

Treasurer, Ken Garber: Ken indicated our bank balance is \$7,080 and we have 121 paid up members. In addition to Sky and Telescope magazine, Astronomy and Amateur Astronomer have been added to the Windsor Centre's monthly subscriptions and are available to members to borrow from the library.

Librarian, Milica Rakic: Milica was not able to attend the meeting. Randy Groundwater and Milica will shortly take all the library materials to the observatory and stack them in the new cabinets.

Newsletter Editor, Ken Garber: Ken produced two April newsletters. One had a new name and an issue date of April 1. In one photo a telescope from Saskatoon resembled both a grain auger and a planetary observing telescope 200 inches long. Will this April 1st edition become an annual tradition?

Ken is always looking for material from the membership to print in the newsletter. So if you have any articles, observing experiences or any astronomically related stories you would like to share please pass them along to Ken.

Steve reminded members to send him their current e-mail address changes. He periodically sends astronomical alerts in addition to monthly meeting notices via e-mail.

Director of Public Education, Randy Groundwater: Randy will take his group of learning in retirement students to the observatory on Thursday, March 17th for a tour and do a little observing.

Light Pollution Abatement, Dan Taylor: Dan reported lots of happenings, good and bad over the past few days. Windsor City Council will take its first look at proposed Windsor lighting legislation on March 21 and take it to a vote on April 18th. It will be on the city website next week. In LaSalle, mayor Varga and Council have adopted legislation requiring full cutoff lighting be installed in all new developments. In Lakeshore there is not yet such legislation but there is interest in having it to control objectionable lighting. Truck yard developments and their lighting are a major concern.

Windfarms are a major worry via Transport Canada's rigid stand on lighting them with bright white flashing strobe lights. Then there is the controversial migrating bird factor. Some persons believe towers and windfarms kill birds while others claim there is little supporting evidence. Amateur astronomers are so few in

number their plea for sensible lighting will barely be heard, against more numerous nature people's voices. In the United States, white flashing strobe lights are the standard so it is unlikely Transport Canada allow anything different.

Dan also displayed some night photographs of new glaring pole mounted lights in Lakeshore. Steve described a new type of bright internally lit billboard sign that totally wipe out night privacy of nearby Lakeshore homes. A sign bylaw is needed!

National Council Representative, Tim Bennett: Tim found his internet messages from National ran into the hundreds while he was away for a short vacation. Dealing with all these and attending two day long meetings in Toronto can be tedious. The prime National issue is financial via the drop in the US Dollar exchange rate. It will cause a revenue shortfall of \$47K this fiscal year. This was reduced to \$26K by measures adopted at the national council meeting such as using a lesser quality paper for the Journal. Others include progressively reducing the travel expense allowances for National Reps as they attend each of the three meetings per year. Members are reminded the Journal is available on line.

Observatory Director, Peter Bondy: Peter could not attend the meeting so Steve briefly mentioned projects underway.

There is a possibility of motorizing both the shutter and the dome rotation. With position sensors, limit switches and a computer program written to suit it should be possible to have the dome open in the direction of wherever the telescope points.

Miscellaneous improvements are constantly under way and we now have a "fish eye" peep hole in the main entry door. The step ladder has been stiffened via a strategically added diagonal brace. The control mount on the ladder has been lowered and stiffened to minimize accidental actuation and provide more precise telescope control.

Membership Chairperson, Pierre Boulos: Pierre could not attend the meeting.

Director of Observing, Steve Pellarin: Steve was not able to attend the meeting since he was enjoying March break in Arizona. Instead a spectacular Solar Max DVD prepared by the National Science Foundation was shown to members. Lasting 32 minutes, it was too soon finished. If anyone in the audience had the impression our Sun is a passive old star keeping us warm this video dispelled any such notions! When viewed with appropriate equipment it is a seething mass of fury in every way! A hydrogen alpha sun observing telescope, piggy backed on to our club telescope would be a wonderful addition to our observing capabilities although the cost is pretty substantial.

Continued on next page

March Meeting Minutes

Business

The **Pelee Island Winery "Stargazing" event** is still on for this Saturday, March 19th. It includes a tour of the Winery snacks goodies and wine tasting in addition to a presentation by Randy Groundwater and a bus trip to the observatory. Steve Mastellotto has tickets at \$55 per person.

Astronomy/Earth Day Event: Even though Astronomy Day is officially on Saturday April 16 the RASC Windsor Centre will continue our tradition of celebrating with the Earth Day presentations at the Ojibway Park Nature Centre on Sunday April 24th. Steve asked for volunteers to help set up our display at Ojibway Park which will be held rain or shine. Telescopes are also requested including those equipped with solar filters to observe the Sun. For more information on how you can help out please contact Peter Bondy.

Art Rae gave a weather report contesting our complaints regarding rarely visible night skies this winter. He used 6 years of data collected in the sixties, comparing those winter nights with this past winter. They showed this past February has been a little better than those years. Our sky was clear 25% of the time, clear being defined as at least 20% clear.

Art showed photographs of our dome when it was located at St. Clair College in the early 70's. Randy Groundwater was featured taking part in observing sessions before parking lots lights rendered the site useless. Art is seeking photographs of that era for the St. Clair College archives.

Coffee Break and 50/50 draw: Steve welcomed and introduced new members and guests. The usual draw was made for the 50/50 prize. It was won by Dave Mailloux.

Main Speaker, Juliana Grigorescu: "The Magic of Color in Spectroscopy"

Juliana prepared a well illustrated presentation on the basics of spectroscopy. Then she expanded it to show its use in astronomy and some of the things that can be learned about distant stars.

Starting with a rainbow on a beach she explained how we would only see the world in "greyscale" if it were not for the visible section the electromagnetic energy spectrum. It is only a small slice of a spectrum which features ever higher energies as frequency rises and wavelengths become shorter.

From pure white light a prism will spread that light out into a continuous band of rainbow colors blending smoothly from one color to another.

From individual elements such as hydrogen, light is emitted in discrete frequencies (colors) as electrons drop down from higher to lower energy orbits giving up energy in the form of photons at each step. The lines on a spectrometer are thus called emission lines.

In the reverse case, raising electrons up to higher energy orbits requires energy from photons at specific frequencies at each step. Light consumed in this action is therefore not visible at these frequencies and they are called absorption lines.

These lines are specific to each element making it possible to read the spectra of light from stars to determine the elements producing their bright light.

By examining the position of emission lines from elements along spectra the motion component of a star with respect to us can be learned. If coming our way its light will be shifted towards a higher frequency. Juliana explained this is exactly like a moving train whistle's apparent frequency change from high to low as it passes.

Stars and galaxies can be complex with multiple components moving different directions. Analyzing the resultant spectra can be complex but with care it can be learned if a star has low or high density. Its rotation can be determined as well as whether it has a companion star, stars or even planets orbiting nearby.

In concluding, Juliana hosted a brief quiz in which we learned the Andromeda galaxy is drifting our way! Don't worry we were told, it will drift right through our home galaxy many millions of years from now.

Steve thanked Juliana for her well illustrated, highly technical presentation and for once again tackling a tough subject and making it easier for everyone to understand. Many did not know such a wide variety of information could be retrieved from mere starlight.

Meeting adjourned 10:20 p.m.

David J. Panton Recording Secretary

Wired

www.sundog.clara.co.uk/atoptics/phenom.html

Plenty to keep you busy. Includes software to produce your own Sundogs and Halos.

www.astroman.fsnet.co.uk/atmos.html

www.polarimage.fi

www.weather-photography.com/gallery.php?cat=optics

Excellent and some rare sights.

Columbus (Ohio) Astronomy Society
By way of Amateur Astronomy

Although northern lights are not very frequent at our 42°N latitude, we were treated to a few fairly spectacular auroral displays during the current declining phase of solar activity cycle 23 which had peaked in 2000. When watching such an eerie yet beautiful spectacle, one is understandably driven to ask, "What causes this phenomenon?"

As a kid growing up in Montreal, I remember on some winter nights being downright fascinated at the sight of these auroral light shows (there was very little light pollution where I lived back then!) and being told that aurorae were simply sunlight reflected from polar ice fields. I guess I was dumb enough to believe that, until one day I realized that there is no sunlight falling on polar regions during winter!

And "Lights from demons' lanterns as they search for lost souls" didn't cut it either! So I began looking for a more palatable explanation.

Today we know that the aurora is produced by an intense solar wind disturbing the earth's magnetosphere. The disturbance causes high-energy particles trapped within the magnetosphere to be ejected downward along earth's magnetic field lines into the upper atmosphere where they collide with air molecules and atoms, thereby transferring some of the particles' energy to those atoms or molecules.

As Juliana Grigorescu explained so well during her interesting talk at our March meeting, the atoms and molecules become excited, causing orbiting electrons to jump to a higher energy level. Then, as the electrons quickly fall back to their lower energy level, the molecules or atoms release the energy originally received from the powerful particles. The emitted energy is given up in the form of electromagnetic radiation. If the wavelength of that radiation is in the visible range (400-700 nanometres), we see it as a visible glow. Some of the radiation is also emitted in the ultraviolet portion of the spectrum.

Since each atmospheric gas has its own set of energy levels, each gas has its own characteristic colour. For example, the de-excitation of atomic oxygen can emit green or red light. Molecular nitrogen gives off red and violet light. The various shades of these colours can produce spectacular shows consisting of sheets, pulsating arcs, faint glows, waving draperies, flickering or fast-moving rays, coronas, etc.

How high above the earth is the aurora?... Well, that varies; but aurorae are typically found within the ionosphere, at heights between about 80 and 350 kilometres. And how far south can the aurora borealis be seen?... Northern lights are most frequently observed within the "auroral oval", a roughly 20-degree wide band straddling geographic latitude 65°N. But when the sun becomes highly active and the solar wind more intense, the auroral oval expands and covers lower and lower latitudes. For example, during very high solar activity in March 1989, aurora displays were observed as far south as the Caribbean region. Of course, similar phenomena occur over the south polar regions where they are known as southern lights or aurora australis.

As we head towards the next solar activity minimum in the next year or so, chances of seeing northern lights are fading for us in the Sun Parlour of Canada; but one never knows... the sun can be full of surprises at times. But we can always look forward to cycle 24 reaching a peak a few years down the line!

Dave's Doings

(Making life easier at the observatory)

Here is the cabinet we needed at the observatory. The idea is to have the doors either fully closed or fully open to avoid bumping into them in the dark.

It is fully sealed to keep out dust, bugs etc. etc. The doors are 3/4 inch thick plywood so it could have a pretty substantial padlock if desired. The whole cabinet is currently mounted via only four screws into the studs per the photograph. It could be made much more difficult to remove by driving screws through the studs into its sides. They are also 3/4 inch thick plywood.



The shelves can be set at different levels in half inch increments. I made an extra shelf and left it complete with extra mounting screws.



The "Mark II" controller holder as finally modified for full control stick motion in all directions. As you can see, the top of the stick is now lower than the top of the ladder handle. The idea is to avoid inadvertently actuation as sometimes happened with the original Mark 1 version set higher. So far It seems to be a big improvement. There is an added benefit, one's hand is better steadied on the support. This gives more precise motion control.

When you change one thing you lose another.

When observing objects low on the horizon it is necessary to stand on the top step of the ladder.

The reach further down to the controller is not quite as convenient but it is not a problem.



Light Pollution Report and the City of Windsor by Dan Taylor

And the City of Windsor

This announcement outlines a remarkable achievement underway in the city of Windsor On. Canada.

Windsor centre members Susan Sawyer-Beaulieu and I were invited to take part in the city's Lighting Intensity Standards Study. The committee was made up of a broad based community group from industry, design, and municipal interest.

The study and initiative to move to full cut off luminaires was instigated by city officials. It was through seminars that the understanding and potential of such measures was achieved. These seminars in part were conducted by RASC National LPA officers.

After 12 exhaustive meetings, over three months a unique document was hammered out that is comprehensive and has far reaching consequences. This model demands full cutoff luminaires (fco) in ALL instances of ALL new developments. Further, it mandates the following; a look at existing development and applying the same standards, launches the city's utility service, Enwin, to investigate the installation of fco right of way luminaires (street lights), and finally the sign bylaw will be amended when it is due for review.

Intensity levels are also stipulated. For the most part they are set below currently established levels.

Susan and I both had a meaningful role in the formation of this paper. The needs and impact of light pollution and light pollution abatement was outlined in a formal presentation. Public education was emphasized and entrenched. The fco definition they were using was in reality only 'cutoff'. This error was pointed out and subsequently corrected. A formal complaint procedure was outlined. City representatives were made aware that the members of the Windsor centre will be most eager to ensure compliance. Formal adoption takes place in council chambers on April 18.

A letter writing campaign by Windsor centre members is underway in support of the study. Thus far councilors have been very favourable to the study ideals. A number of them are proactive in environmental issues. Here is a link to the complete document: <http://www.citywindsor.ca/LightingIntensityStandardsStudy.pdf>

On behalf of Susan and myself we invite you look it over. It marks a pivotal point with light pollution abatement efforts in the Windsor region. Perhaps you may find this template useful in your community.

Dan Taylor, RASC Windsor Centre, LPA Chair

Centre Communications

Newsletter Tidbits...

You may see a couple of 'holes' in this issue. They aren't Black Holes (white holes??). They're spaces screaming for text. So if you've got something astronomically you'd like to see published? An article, photos you've taken, interesting website or whatever? Ask or submit them to Steve, Ken or Dan. Don't worry about length, spelling, or grammar - we'll take care of the rest.

This space for 'rent'.

Your "bits" here.

And you're not just limited to this little space—use as much as you need!

New Members

The Windsor Centre would like to welcome the following to the fold:

Ken Boudreau Windsor

Rick Marion Windsor

Marwan Kishek Windsor

Hallam Sky Clock

cleardarksky.com/c/Hllm0b0Nkey.html?1

For Sale

FOR SALE

A pair of 3.5" Finder/Guidescope rings complete with 3-point alignment screws. \$40.00

For more information, please contact Susan Sawyer-Beaulieu at susanssb@cogec.ca or at 972-5516.

FOR SALE

"Biosphere 2" located in Oracle, Arizona

Check www.bio2.com for details

Renewing soon???

Don't forget that you can renew your membership at the treasurer's desk, by snailmail to the National, or at the RASC's 'store' at <http://www.store.rasc.ca/>