JOINT COMMISSION MEETINGS

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JOINT COMMISSION MEETING ON

GIANT H II COMPLEXES OUTSIDE OUR GALAXY

(Commissions 28 and 40)

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STAR FORMATION ACTIVITY IN GIANT HII COMPLEXES

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With the advent of powerful instruments in various spectral domains many scientists became involved in the study of giant HII regions - i.e. regions as important as 30 Doradus in the Large Magellanic Cloud or NGC 604 in Messier 33 - and of HII complexes still more active such as isolated extragalactic HII regions, some galactic central regions, chains in large spirals and clumpy irregular galaxies.

In view of the importance of these investigations for the problems of formation and evolution of stars and of galaxies, we organized a Meeting at the IAU XVIIIth General Assembly on "Giant HII complexes outside our Galaxy" with the following program:

a- Observational results and their primary interpretations in the X-ray, UV, visible, IR and radio domains.
b- Confrontation with related investigations in our Galaxy and general interpretations.

Six scientists delivered review papers which are published in the following chapters of Highlights of Astronomy.

As an introductory contribution we give here an evaluation of the star formation activity (SFA) in a selection of giant HII complexes choosen from the best investigated ones: two giant HII regions, a chain of giant HII regions and a "clump" in a clumpy irregular galaxy. The Table lists their properties. References may be found in the following chapters.

To obtain indicators of SFA in the complexes we use the luminosities in the five spectral domains and refer them to 30 Doradus through a gross average: a- we divide the luminosities by those at their left, b- take log averages across the five domains and c- across the various combinations of pairs of complexes. To obtain the SFA of the parent galaxies from their giant complexes we simply multiply by the number of such complexes.

What is striking is the very large range of SFA indices obtained for the complexes, from 1 to nearly 100 times 30 Doradus; this is even more striking when remembering that 30 Dor dwarfs even the strongest HII regions of our Galaxy or of M31. It is remarquable that in spite of its

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Table. Star forming activity (SFA) in a selection of giant HII complexes

HII COMPLEX name	30 Dor	NGC 604	NGC 5461	1"clump"	units
nature	giant HII region	giant HII region	chain of giant HII regions	hyperactive HII complex	
distance	0.055	0.72	7.0	49	Mpc
size	300x300	250x250	2,300x900	300x300	pc
luminosities:					
radio (6 cm)	9.0	4.1	130	340(a)	10^{25} erg s^{-1} Hz^{-1}
IR (2.2 μm)	-	1.3	23	860(b)	10^{25} erg s^{-1} Hz^{-1}
optical (B)	-	-	1.3(c)	4.4	10^{8} sun
UV (155 nm)	1.8	2.8	115	210	10^{25} erg s^{-1} Hz^{-1}
X (.5-4.5 kev)	20	<1(d)	$\lesssim$20(d)	2,000(b)	10^{37} erg s^{-1}
SFA of complex	1	0.5	15	90	30 Doradus
PARENT GALAXY name	LMC	M33	M101	Mkn325	
nb.of complexes	1	2	4	10	
parent gal.SFA	1	1.0	60	900	30 Doradus

a: from clump luminosity in clumpy galaxies Mkn 7 and 8
b: assumed 1/10th of global luminosity
c: interpolated from NGC 5455 and 5462
d: upper limits used with half weights in average

modest linear size a clump dwarfs by a factor 6 a chain with much larger size.

For the parent galaxy the range of SFA is still larger, reaching nearly 1,000; though they are only 10 times brighter than the LMC, the class I spiral M101 is 60 times and the clumpy irregular galaxy Mkn325 is 900 times more active than 30 Doradus.

The sequence of the Table is well distributed by steps of 10 over a wide range of $(\text{distance})^{-1}$ and at the same time spans a very large range of star forming activity. This is most favorable from both the observational point of view and the one of physical interest and the triad LMC/M33/M101, with an extension to Mkn325, may make a choice basis for future advanced investigations, such as with the Space Telescope Faint Object Camera.

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