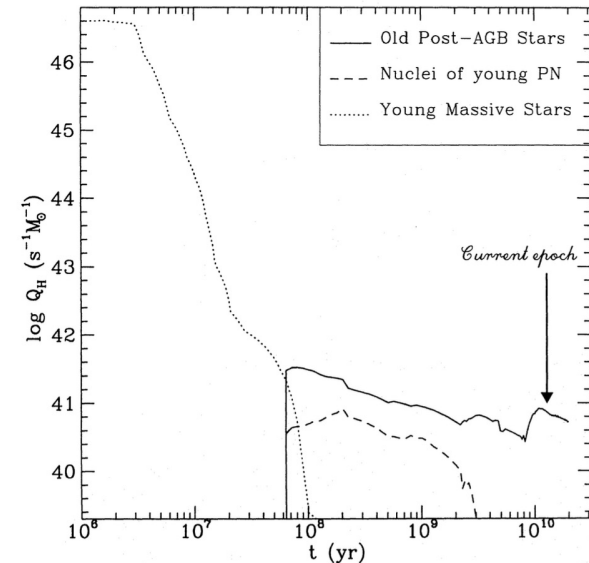


10:15 - IT - Grazyna Stasinska (France):
Modeling emission lines in early type galaxies

Photoionization in elliptical galaxies by old stars

L. Binette¹, C.G. Magris², G. Stasińska¹, and A.G. Bruzual^{3,2}

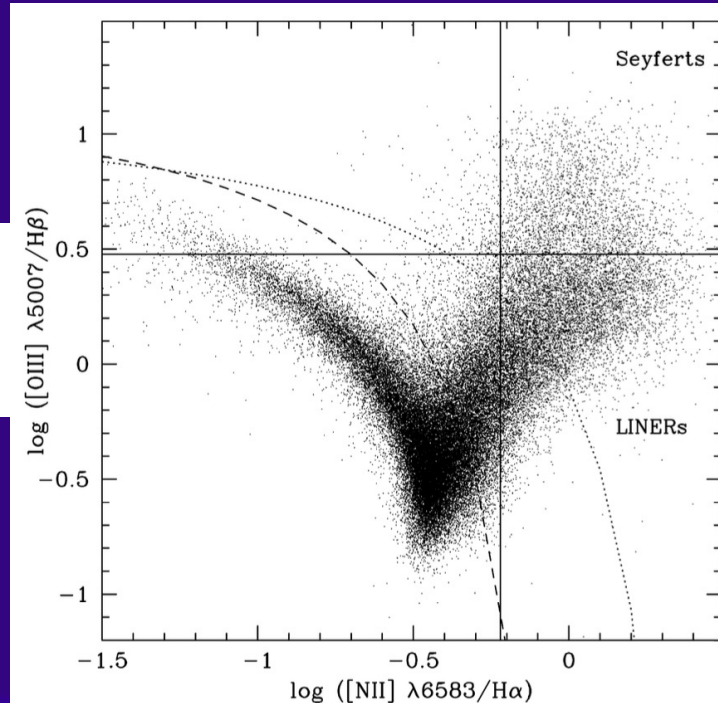
Abstract. In an effort to explain the ionization of gas in elliptical galaxies, we have computed the Lyman continuum output from an ageing starburst, using isochrone synthesis spectral evolution techniques. We have shown that **post-AGB stars provide sufficient ionizing radiation to account for the observed H α luminosity and equivalent width in very early type galaxies. Photoionization models using the radiation field from these stars are shown to easily reproduce the excitation level of the ionized gas.** Thus, we argue that the ionization observed in normal elliptical galaxies is provided by their old stellar populations.



The host galaxies of active galactic nuclei

Guinevere Kauffmann,^{1★} Timothy M. Heckman,² Christy Tremonti,²

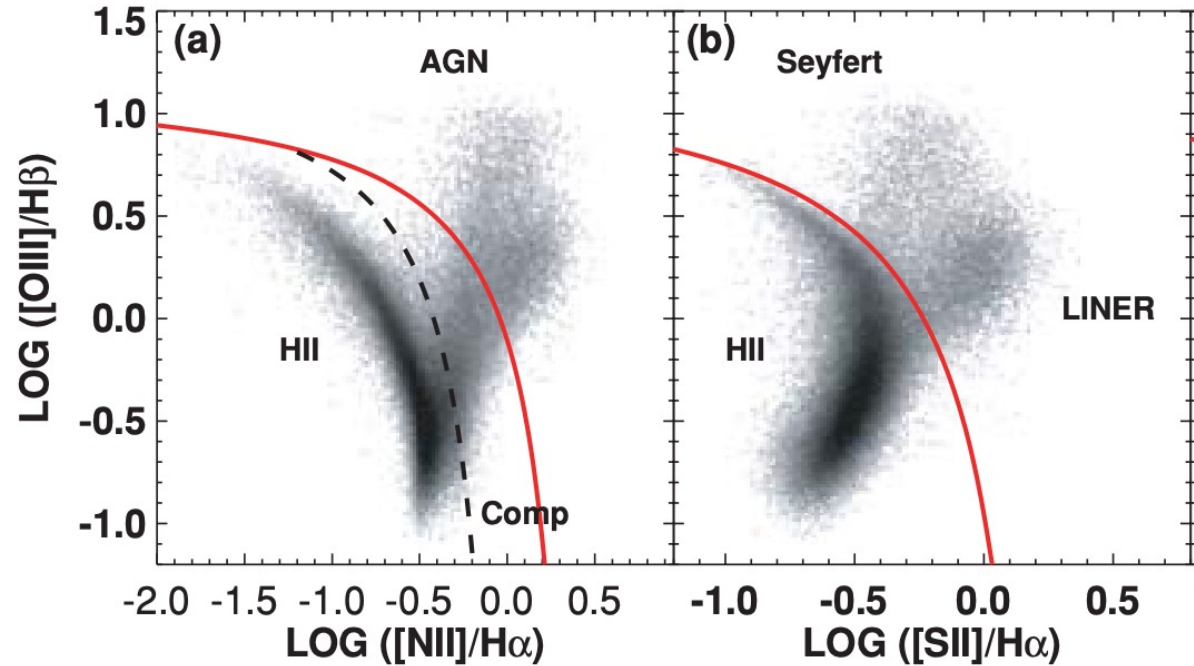
the low-ionization **nuclear** emission regions (**LINERs**),
have [OIII] $\lambda 5007$ and H α narrow-line region (NLR)
emission-line luminosities in the range $\sim 10^5$ – $10^6 L_{\odot}$



The host galaxies and classification of active galactic nuclei

Lisa J. Kewley,^{1★†} Brent Groves,² Guinevere Kauffmann² and Tim Heckman³

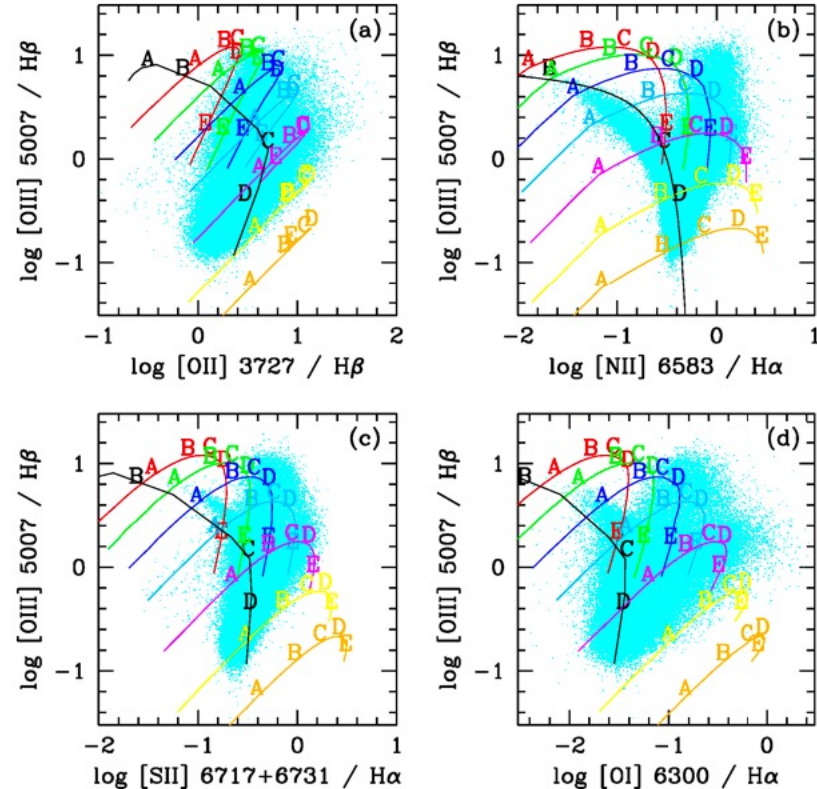
We show that Seyferts and low-ionization **narrow** emission-line regions (**LINERs**) form clearly separated branches



Can retired galaxies mimic active galaxies? Clues from the Sloan Digital Sky Survey

G. Stasińska,^{1★} N. Vale Asari,^{1,2} R. Cid Fernandes,^{1,2} J. M. M. Schlickmann,² A. Mateus,³ W. Schoenell,² L. Sodré Jr

Galaxies in the right wing are referred to as Seyfert/LINERs, leading to the idea that non-stellar activity in galaxies is a very common phenomenon. Here, we argue that a large fraction of the systems in the right wing could actually be galaxies which stopped forming stars. The ionization in these ‘retired’ galaxies would be produced by hot post-asymptotic giant branch stars and white dwarfs



Emission lines in early-type galaxies: active nuclei or stars?

A. Capetti¹ and R. D. Baldi^{1,2}

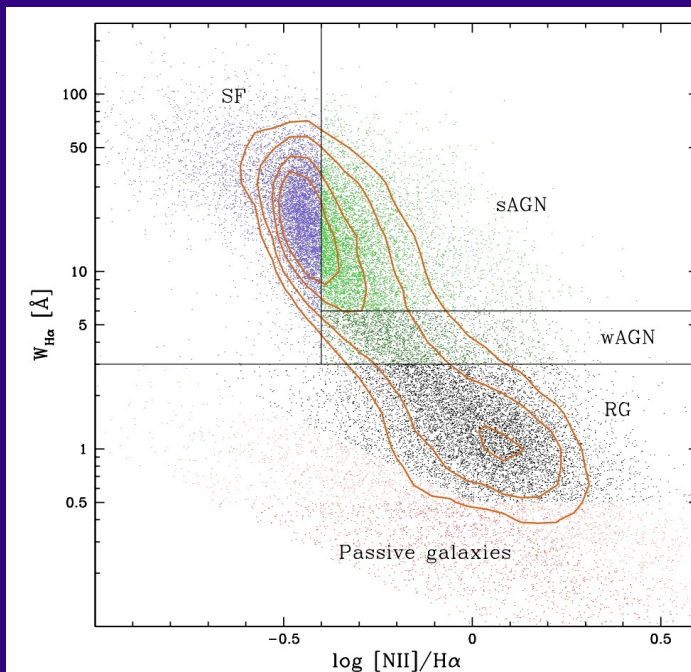
We selected 27 244 nearby, red, **giant early-type galaxies** (RGEs) from the Sloan Digital Sky Survey (SDSS).[...]
Emission lines diagnostic diagrams do not reveal a distinction between the AGN subset and the other members of the sample, and consequently they are not a useful tool for establishing the dominant source of the ionizing photons, which is better predicted by the *EW* of the emission lines.

A comprehensive classification of galaxies in the Sloan Digital Sky Survey: how to tell true from fake AGN?

R. Cid Fernandes,^{1★} G. Stasińska,² A. Mateus¹ and N. Vale Asari¹

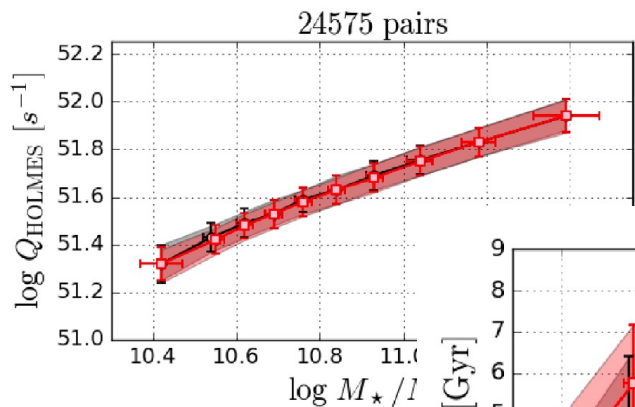
The LINER region in the BPT diagram also contains galaxies that have stopped forming stars and are actually ionized by the **hot low-mass evolved stars (HOLMES)** contained in them.

The **WHAN diagram** [...] allows the differentiation between **two very distinct classes that overlap in the low-ionization nuclear emission-line region (LINER) region of traditional diagnostic diagrams**. These are galaxies hosting a weakly active galactic nucleus (**wAGN**) and ‘**retired galaxies**’ (**RGs**), i.e. galaxies that have stopped forming stars and are ionized by their hot low-mass evolved stars.



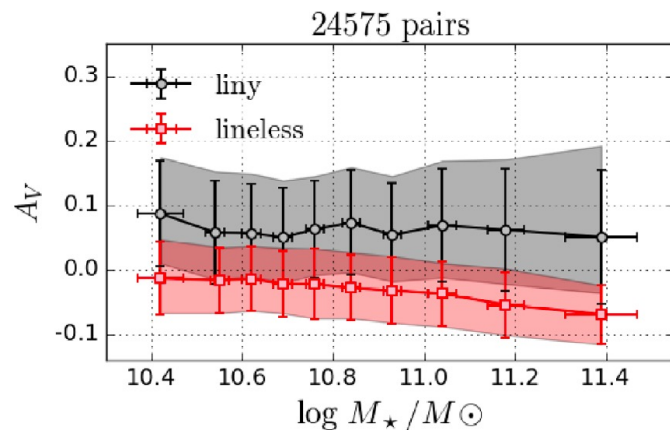
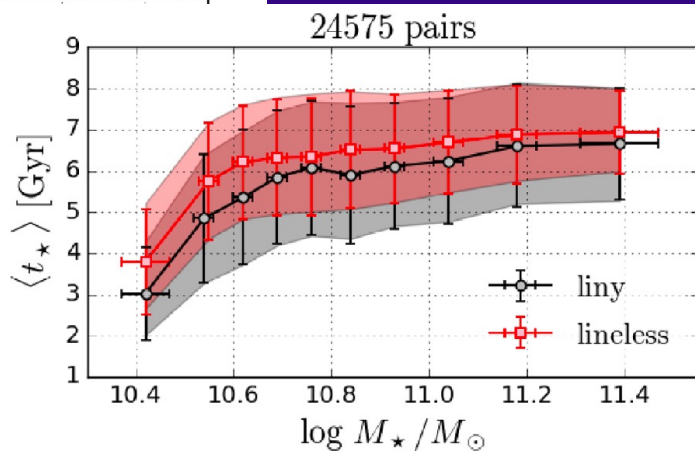
Why do many early-type galaxies lack emission lines? I. Fossil clues

F. Herpich,^{1,2★} G. Stasińska,³ A. Mateus,¹ N. Vale Asari^{1,4,5} and R. Cid Fernandes¹



Liny RGs have an excess of **intermediate-age** (0.1–5 Gyr) stellar populations.

Liny RGs show **higher dust attenuation**

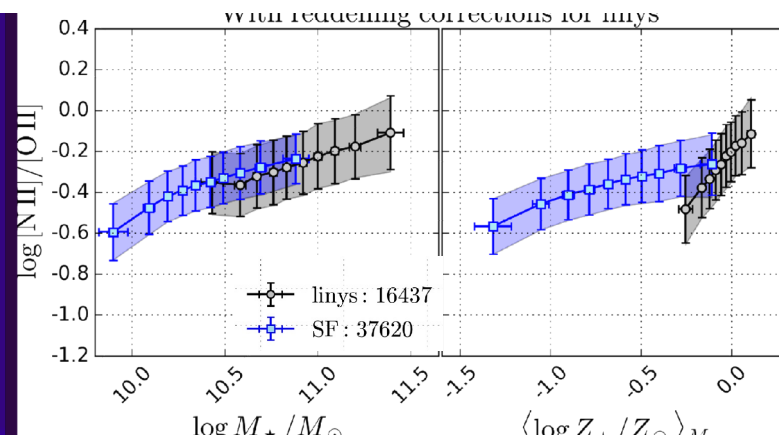


Why do many early-type galaxies lack emission lines? I. Fossil clues

F. Herpich,^{1,2★} G. Stasińska,³ A. Mateus,¹ N. Vale Asari^{1,4,5} and R. Cid Fernandes¹

The amount of warm gas needed to explain the observed H α luminosity in liny RGs is 10^5 – 10^8 M_{\odot} , [...]

Their [N II] / [O II] emission-line ratios are typical of those of the most massive star-forming galaxies. [...] these results rule out [...] mass-loss from intermediate-mass stars. [...] The ionization source and the origin of the gas producing the emission lines are thus disconnected.





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On the origin and fate of ionised-gas in early-type galaxies: The SAURON perspective

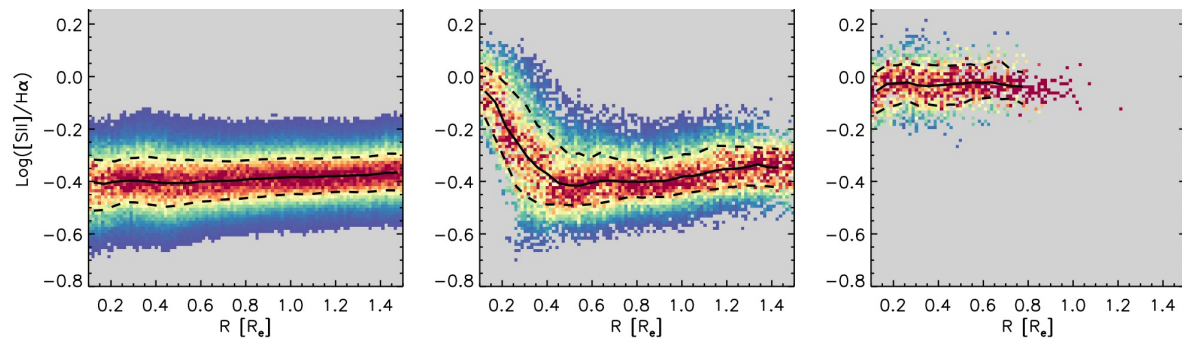
Marc Sarzi ^{a,*}, Roland Bacon ^b, Michele Cappellari ^c, Roger L. Davies ^c,

By detecting ionised-gas emission in 75% of the cases, the SAURON integral-field spectroscopic survey has further demonstrated that early-type galaxies often display nebular emission. [...] Perhaps most puzzling was the finding that round and slowly rotating objects generally display **uncorrelated stellar and gaseous angular momenta, consistent with an external origin for the gas.**

SDSS IV MaNGA – spatially resolved diagnostic diagrams: a proof that many galaxies are LIERs

Francesco Belfiore,^{1,2★} Roberto Maiolino,^{1,2} Claudia Maraston,³ Eric Emsellem,^{4,5}

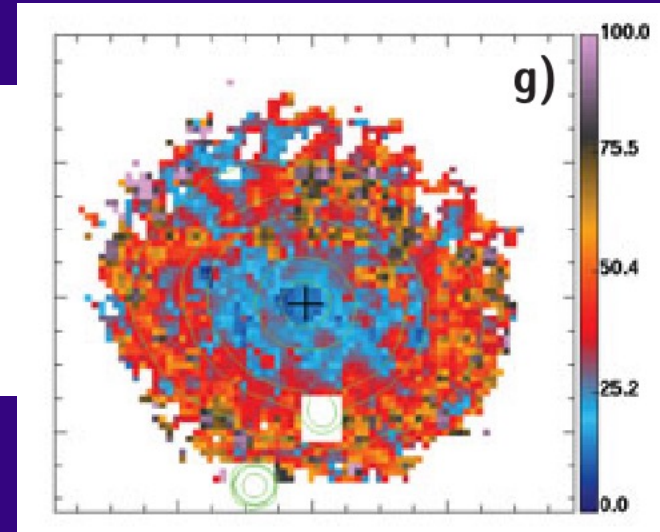
We identify two main classes of galaxies displaying **LIER** emission: ‘central LIER’ (cLIER) galaxies, where **central LIER emission is spatially extended, but accompanied by star formation at larger galactocentric distances**, and ‘extended LIER’ (eLIER) galaxies, where **LIER emission is extended throughout the whole galaxy**.



Spectroscopic aperture biases in inside-out evolving early-type galaxies from CALIFA★

J. M. Gomes¹, P. Papaderos¹, J. M. Vílchez², C. Kehrig², J. Iglesias-Páramo^{2,3}, I. Breda¹, M. D. Lehnert⁴,

SDSS spectroscopy is restricted to the inner (SF-devoid LINER) zone, which causes the galaxies to be erroneously classified as “retired”, that is, systems entirely lacking SF, and whose faint nebular emission is solely powered by the post-AGB stellar component.



New models for the evolution of post-asymptotic giant branch stars and central stars of planetary nebulae[★]

Marcelo Miguel Miller Bertolami^{1,2,★★}

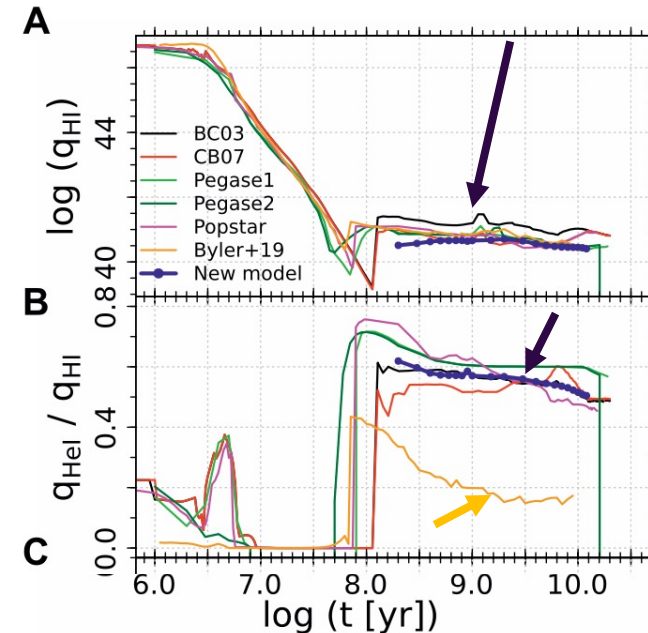
We present a new grid of models for post-AGB stars that **take into account the improvements in the modeling of AGB stars in recent decades.**

[...] We find **post-AGB timescales that are at least approximately three to ten times shorter than those of old post-AGB stellar evolution models.** [...] The new models are also **$\sim 0.1\text{--}0.3$ dex brighter than the previous models** with similar remnant masses.

Planetary Nebulae and the Ionization of the Interstellar Medium in Galaxies

Grażyna Stasińska^{1*}, Marina Trevisan² and Natalia Vale Asari³

Given the **big changes** in the predicted evolution of HOLMES, it is natural to ask **how they affect the computed output of ionizing photons produced by aging stellar populations.**



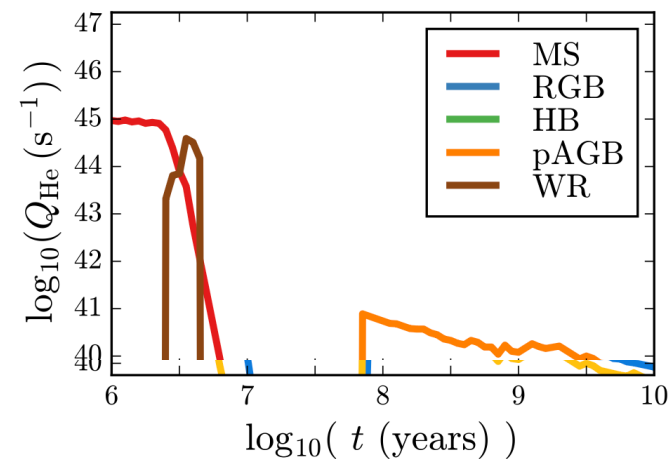
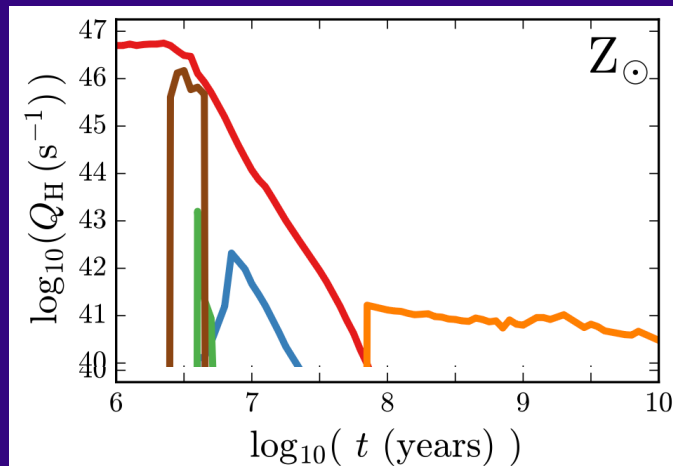


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Self-consistent Predictions for LIER-like Emission Lines from Post-AGB Stars

Nell Byler^{1,2} , Julianne J. Dalcanton² , Charlie Conroy³ , Benjamin D. Johnson³, Jieun Choi³ , Aaron Dotter³ , and

We use evolutionary tracks from the **MIST8** (Choi et al. 2016; Dotter 2016), single-star stellar evolutionary models, which include the effect of stellar rotation. The evolutionary tracks are computed using the publicly available stellar evolution package Modules for Experiments in Stellar Astro- physics (**MESA** v7503; Paxton et al. 2011, 2013, 2015)

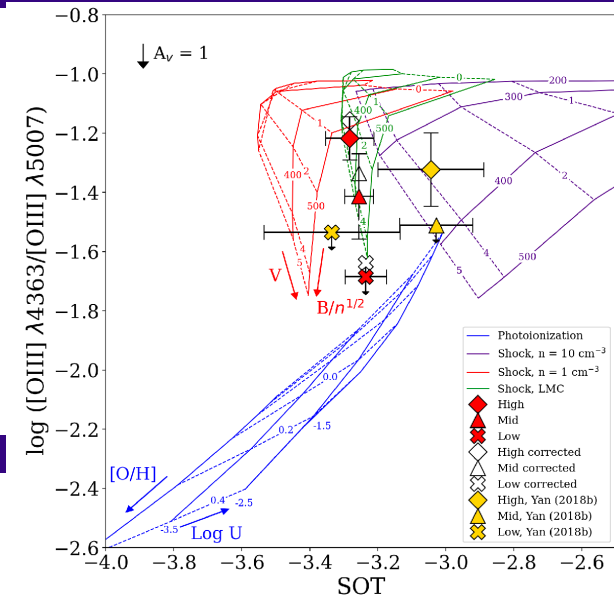


Ionized gas in quiescent galaxies: Temperature measurement and constraint on the ionization source

Man-Yin Leo Lee^{1,★}, Renbin Yan^{1,★}, Xihan Ji^{2,3,4}, Gerome Algodon⁵, Kyle Westfall⁵, Zesen Lin¹,

Photoionization by post-asymptotic giant branch (pAGB) stars and **interstellar shocks** can only be distinguished with in-depth analysis. As the **temperature predictions of these two models differ**, temperature measurements can provide strong constraints on this puzzle. [...] We compared the measured temperatures with predictions from different models.

This work provides strong evidence for interstellar shocks as the ionization source of LIERs.



Direct-method metallicity gradients derived from spectral stacking with SDSS-IV MaNGA

Amir H. Khoram^{1,2,3}  and Francesco Belfiore⁴ 

The [OIII] temperatures become substantially larger than those of other ions at high metallicity, indicating potentially unaccounted for spectral contamination or additional physics.

In this work we consider the [OIII] temperatures unreliable and exclude them from ionic abundance measurements.

Can retired galaxies mimic active galaxies? Clues from the Sloan Digital Sky Survey

G. Stasińska,^{1★} N. Vale Asari,^{1,2} R. Cid Fernandes,^{1,2} J. M. Gomes,^{1,2}

Not much is known about the **gas distribution**

THE ASTROPHYSICAL JOURNAL, 699:923–932, 2009 July 10

doi:[10.1088/0004-637X/699/2/923](https://doi.org/10.1088/0004-637X/699/2/923)

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MASS LOSS FROM PLANETARY NEBULAE IN ELLIPTICAL GALAXIES

JOEL N. BREGMAN AND JOEL R. PARRIOTT

While our calculations indicate certain types of behavior for the mass loss from stars, **it will require a more ambitious set of calculations** to properly determine the fractional mass of cool gas and the emission-line strengths.

MNRAS **527**, 1317–1332 (2024)

<https://doi.org/10.1093/mnras/stad>

Advance Access publication 2023 October 21

The formation channels of multiphase gas in nearby early-type galaxies

Ryan Eskenasy^{1★}, Valeria Olivares,¹ Yuanyuan Su¹ and Yuan Li²

The processes responsible for the assembly of cold and warm gas in ETGs are not well understood.

ChatGPT ▾

Takeaway: Even in their apparent quiescence, early-type galaxies tell a story of past activity and ongoing transformation. Emission line modeling is key to unlocking this hidden history.