Let's Negotiate: A Principle of Balancing Non-alternation and Alternation in Tonal Metres

Yuxuan (Melody) Wang
Harvard University

Poetic metres govern the basic rhythmic patterns of verses and/or lines in verses. The metres of Indo-European languages such as English, Greek, and Latin have been intensively studied. Some metres even serve as a primary data source for the study of a language's phonology, especially when the language itself is now extinct (e.g. Sanskrit). In contrast, metres for poetry in tonal languages are relatively unexplored. Poems written in Chinese at most stages of its development employ complex metres as well. Although these metres have been described extensively in traditional Chinese literature and analysed in several papers within the generative framework (e.g. Chen, 1979; Graham, 1980; Lorentz, 1980; Yip, 1980; Xue, 1989; Napoli, 1989, 1991), they have not been compared with the phonology of Chinese or other tonal languages.

In this paper, I analyse the metre of 'regulated verse' in Middle Chinese and propose that it calls for a new principle in generative metrics, namely the coexistence of non-alternation and alternation in the feature of a language modulated by the metre. Metrical templates for regulated verse dictate that tones must alternate in a line according to their categories, but not too abruptly. In addition, I argue that this feature of the metres of regulated verse mirrors the general tonal preferences in Chinese phonology.

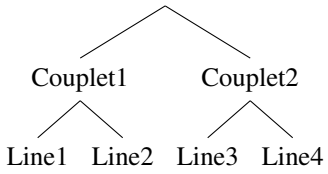
The paper is arranged as follows. Section 1 introduces regulated verse and its metrical templates. Section 2 makes observations of the templates and explains why it can be concluded that the regulated verse metres require both alternation and non-alternation of tones. Section 3 provides a case study on a rule in regulated verse called 'No Lone Even' to demonstrate the effects of the interaction between alternation and non-alternation. Section 4 discusses how the metres of regulated verse is informed by and in turn informs natural language phonology. Section 5 concludes.

1 Background[1]

Regulated verse (or *jìntǐshī* 近体诗) is a type of traditional Chinese poetry flourished in the Tang Dynasty (618−907 AD). Poems generally have four or eight lines, and each line has five or seven characters/syllables. Every two lines make up a couplet, and every four lines make up a quatrain (1).

(1) How lines are grouped into couplets and quatrains in regulated verse

a. Four lines:

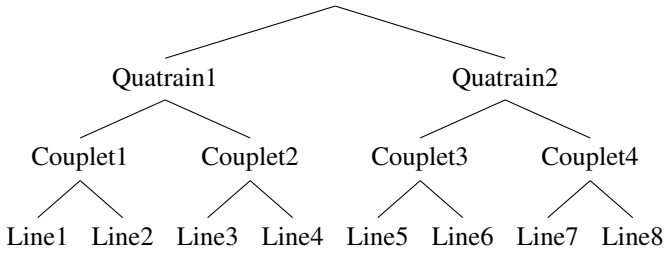


* This project is greatly indebted to Kevin Ryan. I would also like to express my gratitude to Mike Hammond, Mirella Blum, Jennifer Kuo, Ben Eischens, and Aljoša Milenković for visiting my poster at the main session of AMP 2025.

[1] Unless otherwise stated, the descriptions of Chinese poetry come from Wang (1957, 1962).

Proceedings of *AMP 2025*

b. Eight lines:



Middle Chinese was spoken at the time regulated verse became popular. There were four tones in Middle Chinese, which were divided into two categories. The level (*píng* 平) tone constitutes its own category 'even' (*píng shēng* 平声), and the rising (*shǎng* 上), falling (or 'departing', *qù* 去) and checked (or 'entering', *rù* 入) tones make up the category 'oblique' (*zè shēng* 仄声). I will represent these two tone categories with E and O respectively in what follows.

Poets were required to strictly follow the rigid metrical templates that restrict the tone category allowed to appear at each position in a line. Such regular alternation of tone sequences exists not only within the line but also between two adjacent lines in a couplet. The canonical templates, arranged by the number of syllables in a line and the tone of the first character in a poem, are given in (2). The templates for eight-line poems are always composed by doubling a template for four-line poems, so this paper looks at four-line poems only. Depending on the number of syllables in a line (5 or 7) and the tone category to which the first character of the poem belongs (even or oblique), there are four templates in total for four-line poems. Four couplet types are defined in the same way. Heptasyllabic lines are extensions of pentasyllabic lines by adding two syllables carrying the opposite tone to that of the first (two) syllable(s) at the beginning of the latter. For example, the first line of Couplet-7E, EEOOEEO, is constructed by adding two E-toned syllables at the beginning of OOEEO, the first line of Couplet-5O. Hence, I will focus primarily on the last five syllables of each line.

Like many other metres, the templates for regulated verse allow some level of freedom. Free positions that are allowed to use the tone category other than the canonical one specified by the template are highlighted in bold in (2)[2]. The last position of each line is never free, which is also statistically confirmed by Duanmu & Stiennon (2005:24-25). Analogous to the tradition of Western metrics, I will call the use of the non-canonical tone category 'inversions'.

(2) Canonical templates for regulated verse

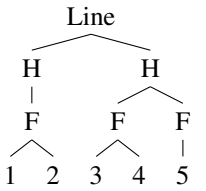
		initial tone					
		even			oblique		
length	five	a.	Couplet 5E	**E**EEOO **O**OOEE	b.	Couplet 5O	**O**OEEO EEOOE
			Couplet 5O	**O**OEEO EEOOE		Couplet 5E	**E**EEOO **O**OOEE
	seven	c.	Couplet 7E	**EE**O**O**EEO **O**OEEOOE	d.	Couplet 7O	**OOE**EEOO **EE**O**O**OEE
			Couplet 7O	**OOE**EEOO **EE**O**O**OEE		Couplet 7E	**EE**O**O**OEEO **O**OEEOOE

The templates for regulated verse have been analysed multiple times using linear (Wang, 1957; Downer & Graham, 1963; T'sou, 1968; Jakobson, 1970; Lorentz, 1980; Napoli, 1991), hierarchical (Chen,

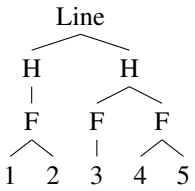
[2] There has long been a misunderstanding that the free positions are positions 1 and 3 of pentasyllabic lines, and positions 1, 3, and 5 of heptasyllabic lines, as summarised by the '1-3-5' Rule: 'Licence for 1, 3, and 5, strictness for 2, 4, and 6' (Wang, 1957). However, as clarified by Wang (1962), the 1-3-5 Rule is in fact a misnomer for the actual generalisation. Why the 1-3-5 Rule is problematic falls outside the scope of the current paper, so I will not discuss it in detail and simply follow the templates and generalisations proposed by Wang (1962).

1979; Graham, 1980; Yip, 1980; Xue, 1989) and grid-based (Napoli, 1989) approaches. Although these analyses differ significantly in their treatment of a line, most studies since Chen (1979) have agreed on two points. First, every line can be further divided into two half-lines or hemistiches (H) and every hemistich into feet (F). Second, the two syllables in each foot must carry tones from the same category (i.e., both E or O). So, the pentasyllabic and heptasyllabic lines have the structures in (3) respectively.

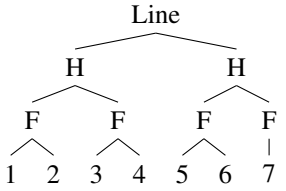
(3) a. OOEEO and EEOOE lines:



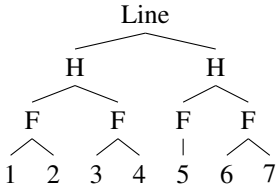
b. OOOEE and EEEOO lines:



c. OOEEOOE and EEOOEEO lines:



d. OOEEEOO and EEOOOEE lines:



(adapted from Chen, 1979:380)

2 Observations

Given the basics of the metrical templates for regulated verse, this section proposes that the tones of the syllables in each line need to alternate as well as *not* alternate at the same time.

2.1 *Alternation* The feature that most straightforwardly illustrates the need for alternation in regulated verse is the number of consecutive syllables from the same tone category. Because the two syllables in every foot come from the same tone category, it is common to have multiple characters from the same category in a row within a line. However, the number of consecutive syllables from the same tone category allowed by the optimal metrical templates never exceeds three. For example, in Couplet-5E, one gets three syllables with E in succession at the beginning of the first line and three syllables with O in succession in the second line. The same is observed for positions 3−5 of the two lines in Couplet-7O. The absence of an excessive number of syllables from the same tone category shows that the metre regulates tone distribution within a line to avoid monotony, and it is important to have some degree of tonal variation within a line.

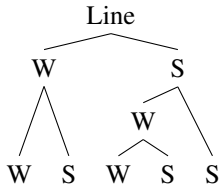
The other aspect that demonstrates the necessity of alternation is more subtle and subject to different analyses. Just like other accentual and quantitative metres, the metrical templates are believed to have positions alternating between strong and weak positions in terms of prominence. However, other metres that are able to manipulate their natural phonological asymmetry such as stress/non-stress and heavy/light, it is difficult to tell which position is stronger in a foot in Chinese poetry, especially given that the two syllables within a foot must bear tones from the same tone category.

Therefore, phonologists have diverged in their analyses of relative prominence between positions. Chen (1979:396) and Yip (1980:108) both argued for an iambic foot because the recitation pattern of the verse shows a clear iambic rhythm. But Napoli (1991:254-257) disagreed and argued that the recitation rhythm could not directly explain the tonal patterns of the templates, because evidence showed that the chanting rhythm is independent of the tones in Chinese verses in general (e.g. Boyce, 1980).

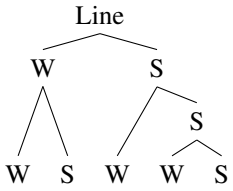
Despite these disagreements, analysts agree that there is a correlation between free positions and the relative prominence of positions. In the arboreal analysis by Chen (1979) and Yip (1980), positions that allow the use of the opposite tonal category must be weak positions, which are the odd-numbered positions as a result of iambic feet (4). In the grid analysis by Napoli (1989), the free positions tend to be those receiving a place on the second level of the grid, which are the more prominent positions in her analysis (5). In other words, the attested tonal patterns are conditioned by prominence alternation between positions in regulated verse.

(4) Arboreal analysis (adapted from Yip, 1980:115-116)

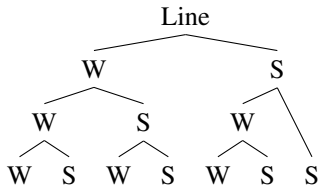
a. OOEEO and EEOOE lines:



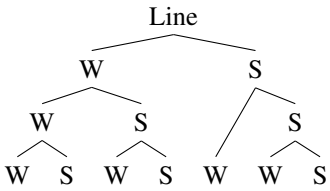
b. OOOEE and EEEOO lines:



c. OOEEOOE and EEOOEEO lines:



d. OOEEEOO and EEOOOEE lines:



(5) Grid analysis (adapted from Napoli, 1989:28-29)

a. EEOOE lines:

x x
x x / x x x

b. OOEEO lines:

x x x
x x / x x x

c. EEEOO lines:

x x
x x / x x x

d. OOOEE lines:

x x x
x x / x x x

e. OOEEOOE lines:

x x x x
x x x x / x x x

f. EEOOEEO lines:

x x x
x x x x / x x x

g. OOEEEOO lines:

x x x x
x x x x / x x x

h. EEOOOEE lines:

x x x
x x x x / x x x

In brief, alternation is an important component of the tonal metrical templates for Chinese regulated verse. On the one hand, it is not allowed to have an excess number of tones in each line on the surface. On the other hand, the positions in each line seem to be asymmetrical to some extent, either in their recitation rhythms or in their ability to tolerate tones from the opposite category specified by the template.

2.2 *Non-alternation* Although some degree of tone variation is necessary in regulated verse, perhaps in contrast with all other metres discussed in previous literature, the optimal metrical templates for regulated verse require that the tonal categories do *not* alternate at the same time.

Accentual metres stipulate that adjacent positions have different stress profiles, and quantitative metres stipulate that adjacent syllables differ in weight. However, this is not true for the metres of regulated verse. The templates in (2) show that, except the final position of each line, every position has at least one neighbouring position with a character from the same tone category. That is, if a position has an E-tone syllable, at least one of the adjacent positions must also have an E-tone syllable, and the same applies to O-tone syllables. In other words, it is not possible to find 'EOE' or 'OEO' in the first four or six positions of each line in the *optimal* template. Indeed, inversions could create 'EOE' or 'OEO' sequences: for example, using an E-toned syllable in the first position of an OOEEO line leads to EOEEO. But even taking inversions into account, a syllable flanked by two from the opposite tone category is not found in the last three positions (i.e. the second hemistich) of each line.

This pattern is in sharp contrast with accentual and quantitative metres, and even other tonal metres. For example, a metre that is greatly influenced by and thus very similar to Chinese regulated verse is the Vietnamese Lục Bát 'six-eight' stanza (6). Lục Bát also regulates the tone category allowed at each position

of the line: flat words have either no tone or a low falling tone, and sharp words have tones with a high component. The metre for Lut Bát dictates that even-numbered positions must use words from the tone category specified, but odd-numbered positions can use words from any tone category, which are marked as 'unregulated' in (6). Unlike the regulated verse, the unregulated positions have no preference for tone category and it is possible to find a flat tone surrounded by two sharp tones or vice versa, even in the second half of the line.

(6) Vietnamese Lục Bát metres (adpated from Kiparsky, 2020:32)

× ♭ × ♯ × $♭_a$
× ♭ × ♯ × $♭_a$ ♯ $♭_b$
× ♭ × ♯ × $♭_b$
× ♭ × ♯ × $♭_b$ ♯ $♭_c$

(× = unregulated, ♭ = flat, ♯ = sharp, subscripts co-index required rhymes)

In short, although regulated verse does require the tones to alternate within a line, such alternation *cannot* be too vigorous, which can be demonstrated by requirement for each syllable to have at least one of its neighbours from the same tone category. Hence, I propose that the metres for regulated verse need alternation and non-alternation at the same time. To strengthen the argument, I present a case study that results from this requirement for simultaneous alternation and non-alternation in the next section.

3 Case study: 'Lone Even'

In traditional literature on Chinese poetry, there is an additional rule besides the metrical templates. Although all the positions allowing inversions are odd-numbered, it is not the case that all the odd-numbered positions allow inversions. Observations show that only the first position in pentasyllabic lines of the first and third position in heptasyllabic lines allow inversions. However, this does not even apply to all the lines. The second line of Couplet-5O does not allow inversion in its first position, and the second line of Couplet-7E does not allow inversion in its third position, which is unsurprising given it is an extension to the second line of Couplet-5O.

Traditional Chinese poets believe that such a ban on inversions is intended to avoid a phenomenon called '*gūpíng*' 孤平 (Wang, 1957), or literally 'Lone Even' (Duanmu & Stiennon, 2005:5). Should these positions allow inversions, each of these two lines would end up with only one character from the E tone category (except the last position), as shown in (7a). However, using a character from the opposite tone category specified by the template in these positions is sometimes inevitable. For instance, the poet might be writing about a person or a city that does not have an alternative name. Under such circumstances, one could save the line by changing the tone category of the character immediately after this lone E, as shown in (7b)[3].

(7)

	a. with 'Lone Even'	b. remedy
Couplet-5O	O<u>E</u>OOE	O<u>EE</u>OE
Couplet-7E	OOO<u>E</u>OOE	OOO<u>EE</u>OE

It is definitely acceptable to have this rule of 'No Lone Even' and its remedy as an addition to the metrical templates for regulated verse, but such rules have little explanatory power, and do not offer much insight as to *why* these positions are prohibited from inversions or *why* it is the E tone that cannot be 'lone' in a line. Instead, I argue that the solution to Lone Even in a line can be derived naturally from the requirement of simultaneous alternation and non-alternation of regulated verse. To make my analysis more accessible to phonologists, I will translate the generalisations of regulated verse into Optimality Theoretic (OT; Prince & Smolensky, 1993) terms in what follows.

OT maps underlying representations onto surface forms with competing violable constraints. In the case of regulated verse, the optimal metrical templates in (2) could be regarded as the underlying representation,

[3] There are in fact two remedies to Lone Even. The alternative method is to change the tone category of the character at the same position in the adjacent line of the same couplet; that is, if one ends up with OEOOE, it is allowed to change the other line in Couplet-5O into EOEEO. Since this paper mainly studies intra-line alternations, I will leave the analysis for the inter-line remedy for future research.

and the possible variants of the optimal template are the candidates for the surface form. The acceptable variant on the surface for a certain line is hence the winning candidate. The line with Lone Even could also be considered as a variant of the optimal template which unfortunately loses to the acceptable proposed remedy. Therefore, what is needed is a set of constraints that can successfully map the optimal template to the remedy and avoid the candidate with the lone E.

Such constraints are deeply rooted in the generalisations made about the lines of regulated verse. To start with, the fact that every syllable needs at least one neighbouring character from the same tone category can be rephrased as a binarity requirement for tones. Constraints such as BIN-E which penalises an E tone flanked by two O tones (8a), or BIN-O penalising an O tone flanked by two E tones (8b), can capture such binarity. That only odd-numbered positions can be free may be formulated as a constraint such as ODD-INVER (8c). Finally, the restriction that the last position of each line never permits inversions can be formalised as NO-INVER-FIN (8d).

(8)

	Constraint	Assign one violation for ...
a.	BIN-E	each non-final E tone being flanked by two O tones.
b.	BIN-O	each non-final O tone being flanked by two E tones.
c.	ODD-INVER	each inversion occurring in an even-numbered position.
d.	NO-INVER-FIN	each inversion occurring in the final position of a line.

The possible variants of the two lines under discussion – the second line of Couplet-5O and the second line of Couplet-7E – are listed in (9) and (10) respectively. How the constraints in (8) need to be ranked to select the right candidate, namely the solution to Lone Even, is also shown in the tableaux. Each of these constraints contributes to one aspect of the prohibition of Lone Even and its solution.

(9) Couplet-5O

	EEOOE	BIN-E	ODD-INVER	NO-INVER-FIN	BIN-O
a. ☞	OEEOE				*
b.	OEOOE	*!			
c.	OOOOE		*!		
d.	OEOEE	*!	*		*
e.	OEEOO			*!	

(10) Couplet-7E

	OOEEOOE	BIN-E	ODD-INVER	NO-INVER-FIN	BIN-O
a. ☞	OOOEEOE				*
b.	OOOEOOE	*!			
c.	OOOOOOE		*!		
d.	OOOEOEE	*!	*		*
e.	OOOEEOO			*!	

Lone Even in a line implies an E-toned syllable surrounded by two syllables with O tones, so the binarity constraint BIN-E stops such lines from appearing on the surface (9b, 10b). ODD-INVER ensures that, even if an E ends up having no neighbour from the same category, remedies should be sought in odd-numbered positions only. Thus, the candidates that invert the only E tone to an O tone cannot be solutions (9c, 10c), because such inversions take place in even-numbered positions. Similarly, adding another E-toned character by inversion in position 4 (or position 6 of heptasyllabic lines) is not a viable solution either (9d, 10d).

In fact, ODD-INVER restricts the search for solutions to positions 1, 3, and 5 (and 7 for lines with seven syllables). Since the first position already involves an inversion that led to the problem of Lone Even, and the final positions do not allow any inversions as required by NO-INVER-FIN, the only possible solution is

to have an inversion at position 3 in a pentasyllabic line, or position 5 in a heptasyllabic line. In other words, the solution lies in the position 'immediately after the lone E' (9a, 10a), which matches perfectly with the description in traditional literature.

However, allowing an inversion immediately after the lone E leads to the violation of another constraint. The E-toned syllable after inversion in position 5 and the line-final E form a sequence of EOE with the O-tone syllable in between, and such a sequence violates BIN-O. But the proposed remedies for Lone Even do contain such sequences. Thus, NO-INVER-FIN must rank above BIN-O to make sure that the EOE sequence remains unchanged at the end of a line. Under such ranking, no inversion can occur in the final position of a line even if the EOE sequence violates the binarity required by BIN-O. BIN-E and ODD-INVER must also rank above BIN-O, given that the latter is the only constraint the winning candidate violates.

In brief, the interaction between constraints regulating alternation (ODD-INVER) and non-alternation (BIN-E, BIN-O, and NO-INVER-FIN) successfully derives the solution to a line with only one E tone from the optimal metrical template. This is an example that effectively demonstrates why the tones in regulated verse need to both alternate and not alternate at the same time.

4 Implications

The previous two sections have shown, through the patterns of the optimal metrical templates and the solutions to the unacceptable line configuration 'Lone Even', that Chinese regulated verse requires the tones in each line to both alternate and not alternate simultaneously. In this section, I discuss how Chinese regulated verse contributes to the study of metres and the knowledge of natural language phonology in general.

4.1 *Metre typology* First, the metres of regulated verse greatly enriches the typology of metres. Previous studies of metres usually focused on Indo-European languages, and most metres analysed in detail in literature were syllabic, accentual, or quantitative. Syllabic metres generally only count the number of syllables in a line and do not mandate that adjacent syllables alternate in quality. But, accentual and quantitative metres do need the syllable feature they regulate – that is, the stress and weight of the syllable – to vary: one cannot have an entire line of unstressed/stressed syllables, or a line of light/heavy syllables, without any variation. The tonal metre of Chinese regulated verse resembles accentual and quantitative metres in that the tones of the syllables in a line also need to vary to some extent. As shown in Section 2.1, the maximum number of syllables from the same tone category in a line that the metrical templates allow is three. Regulated verse enhances the claim that metres track and govern variations in poetry. Regulated verse also behaves like accentual and quantitative metres in the sense that there also seem to be some inherent asymmetries in its positions. The freedom to use the non-canonical tone required by the template differs significantly between odd- and even-numbered positions in regulated verse. This difference has been argued to be comparable to the prominence alternation in accentual and quantitative metres.

On the other hand, the metres of regulated verse have a significant difference from other previously studied metres too. On top of the need for variation, another feature shared by accentual and quantitative metres is that the stress or weight they regulate needs to be different in adjacent syllables. In accentual metres, adjacent syllables need to alternate in stress: an unstressed syllable is usually surrounded by two stressed ones, and vice versa. In quantitative metres, adjacent syllables need to alternate in weight: a light syllable is usually surrounded by two heavy ones, and vice versa. However, the tonal metre of Chinese regulated verse is completely the opposite, in that *no* syllable may be surrounded by two characters from a different tone category, as required by the canonical templates. Although regulated verse also requires tones to alternate, it prefers them to change gradually rather than abruptly.

The enrichment of typology is not restricted to metres for languages that lack tones. Even other tonal metres differ from Chinese regulated verse in terms of the tone categories appearing in adjacent positions. As shown in Section 2.2, although Vietnamese Lục Bát also regulates tones in even-numbered positions more strictly, it does not require syllables to have one neighbour from the same category. In other words, non-alternation is neither an absolute requirement nor an inherent property of tonal language metres. Therefore, regulated verse provides a novel angle for phonologists to consider when studying metres, namely that non-alternation must be balanced with alternation in tonal metres.

4.2 *Natural language and metre* Second, the metres for regulated verse reflect many features of natural languages with tones. The fact that there are never more than three characters from the same tone category

allowed in the optimal template for regulated verse is similar to the number restriction on tone-bearing units (TBUs) in many tonal languages. For example, many Bantu languages exhibit a bounded tone spreading process called 'tone tripling', where an high tone[4] spreads to the following two TBUs within a word, but no further, as exemplified in (11) with Shona. This process is also found in Kanye Tswana (Creissels, 1998), Venda, Kalanga, Tsonga, Copperbelt Bemba (Odden & Marlo, 2019), and Dembwa Taita I (Odden, 2001). In Prinmi, a Tibeto-Burman language spoken in China, no more than two H-toned TBUs and no more than three L-toned TBUs are allowed in a word, with neither type exceeding three (Ding, 2006; Hyman, 2009; Jardine, 2020). (12) provides an example containing three consecutive L-toned TBUs and one containing two consecutive H-toned TBUs, with their respective tonal patterns marked on the right.

(11) Shona H tone tripling (Odden, 2015)

kutórá	'to make'
kutórésá	'to make take'
kutóréséra	'to make take for'
kutóréséra**na**	'to make take for each other'

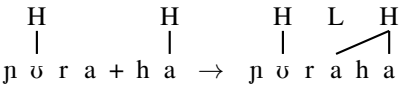
(12) Prinmi tone spreading restrictions (Ding, 2006:14)

bɨ́bˡobˡoge	'as for roasted flour'	HLLL
tõpúmɜ́łe	'donkey tail'	LHHL

Another feature of the metres of regulated verse that resembles tones in natural languages is the prohibition of rapid excursions in tone (McPherson, 2016). In regulated verse, an E tone flanked by two O tones, or an O tone flanked by two E tones, is banned within a line, suggesting that the change of tones cannot be too abrupt. Similarly, many tonal languages around the world also prohibit a tone surrounded by two tones of a different type, captured by the *HLH (Cahill, 2007) or the *TROUGH (Yip, 2002:137) constraint. For example, in Kɔnni (Gur, Ghana), when a sequence of HLH would be expected to occur by combining morphemes, the second H spreads left, delinking the L and causing downstep (13). Other languages that disprefer HLH sequences include Deg, Gã, Esaaka Makhuwa, and Zulu in Africa (Odden, 2000), Mianmin and Kairi in Papua New Guinea (Cahill, 2000), and Iñapari (Arawakan, Peru) and Mamaindé (Nambikwaran, Brazil) in South America (Parker, 1999; Eberhard, 2007).

(13) Kɔnni disprefers HLH sequences (Cahill, 2007)

a. ɲórà 'chests'
b. ɲóˡráhá 'the chests'



Even Chinese has a similar phenomenon, where a dip in pitch is not allowed between two high tones in (Beijing) Mandarin (Chen, 2000). T2 sandhi stipulates that a non-final rising tone [35] becomes a high tone [55] when preceded by a rising [35] or high [55] tone (14), because each of the [55. 35] and [35. 35] sequences creates a dip in pitch. Similarly, the *Yi-bu-qi-ba* rule which only applies to *yi* 一'one', *bu* 不'not', *qi* 七'seven', and *ba* 八'eight' obligatorily changes the tone of these syllables into [35] when followed by another falling [53] tone syllable (15a).

(14) T2 sandhi (Chen, 2000:21-22)

a.	*tian wen tai*	'observatory'	b.	*ren min bi*	'renminbi' (Chinese currency)
	55. 35. 35	base form		35. 35. 51	base form
	55. 55. 35	SF (with sandhi)		35. 55. 51	SF (with sandhi)

(15) Minimal pairs due to *Yi-bu-qi-ba* rule (Chang, 1992:166f; Chen, 2000:22)

a.	*bu dui*	'not correct'	b.	*bu dui*	'troops'
	53. 53	base form		53. 53	base form
	35. 53	SF (*Yi-bu-qi-ba* rule)		53. 53	SF (no change)

[4] In this paper, high tones are indicated with an acute accent. All other unmarked TBUs are low-toned.

An interesting asymmetry between H and L tones exists within a single language as well as crosslinguistically: HLH is commonly banned whereas LHL occurs abundantly. Cahill (2007) attributed this asymmetry to the markedness of H tones, given that systems in which H tones are marked are more frequent than those in which L tones are marked (Maddieson, 1978). This asymmetry has a similar parallel in the metrical templates for regulated verse. On the one hand, there exists a rule that disallows a single E tone in a line, namely the 'No Lone Even' rule, but there is no corresponding rule for O tones. On the other hand, although both EOE and OEO are dispreferred, the latter incurs a worse violation due to the relative ranking BIN-E $\gg$ BIN-O.

In brief, several features of the metres of regulated verse have clear parallels in natural languages with tones, suggesting that metres are not random choices by poets but are, in fact, heavily informed by natural language phonology. More importantly, these features are not confined to Chinese but are widely observed in many tonal languages around the world. Therefore, the metrical characteristics of regulated verse are arguably a reflection of human preference for tonal patterns in general.

5 Conclusion

This paper proposes a new principle of balancing non-alternation and alternation in tonal metres with evidence from the metres of Middle Chinese regulated verse. Regulated verse requires the tones of syllables in each line to alternate in tone categories and not alternate too abruptly at the same time. The alternation requirement is observed in the number of consecutive syllables allowed to carry tones from the same category, as well as in the asymmetry of the positions' ability to permit the use of the opposite tone category specified by the canonical template. The non-alternation requirement is found in the fact that each syllable must have at least one neighbour with a tone from the same category. The fact that these two requirements must be balanced is demonstrated with a rule named 'No Lone Even' in regulated verse, which – when analysed with the tools of generative metrics – naturally falls out as a result of the interaction of the OT constraints representing alternation and non-alternation. This feature of regulated verse significantly enriches the typology of poetic metres.

It is also shown that these characteristics of regulated verse greatly resemble those of the phonology of tonal languages in general. The 'up-to-three' restriction on the number of consecutive tones in the optimal metrical templates is similar to tone tripling in many tonal languages around the world, and the dispreference for EOE and OEO sequences patterns with the prohibition of rapid reversals in pitch in tonal languages, including Mandarin Chinese. In conclusion, regulated verse is another case showing that metres are not merely a matter of poets' personal preference, but the most balanced option under the tension between the natural tendency of tones to spread and the rhythmic alternation required in poetry.

References

Boyce, Donal D. (1980). Min Sandhi in Verse Recitation. *Journal of Chinese Linguistics* 8:1, 1–14.

Cahill, Michael (2000). Tonal Diversity in Languages of Papua New Guinea. Paper presented at Tromsø Tone Symposium, University of Tromsø, Norway.

Cahill, Michael (2007). More Universals of Tone. *SIL Electronic Working Papers* 72.

Chang, Mei-Chih Laura (1992). *A prosodic account of tone, stress, and tone sandhi in Chinese languages*. Ph.D. thesis, University of Hawaii.

Chen, Matthew Y. (1979). Metrical Structure: Evidence from Chinese Poetry. *Linguistic Inquiry* 10:3, 371–420.

Chen, Matthew Y. (2000). *Tone Sandhi: Patterns across Chinese Dialects*. Cambridge University Press, Cambridge.

Creissels, Dennis (1998). Expansion and retraction of high tone domains in Setswana. Hyman, Larry M. & Charles W. Kisseberth (eds.), *Theoretical aspects of Bantu tone*, CSLI Publications, Stanford, 133–194.

Ding, Picus Sizhi (2006). A Typological Study of Tonal Systems of Japanese and Prinmi: Towards a Definition of Pitch-accent Languages. *Journal of Universal Language* 7:2, 1–35.

Downer, G. B. & A. C. Graham (1963). Tone Patterns in Chinese Poetry. *Bulletin of the School of Oriental and African Studies, University of London* 26:1, 145–148.

Duanmu, San & Nathan Stiennon (2005). Tonal Patterns in Chinese Regulated Verse: A Corpus Study. *Taiwan Journal of Linguistics* 3:1, 1–31.

Eberhard, David (2007). Mamaindê tone: An account of plateauing in an Amazonian language. Wetzels, W. Leo (ed.), *Language endangerment and endangered languages: Linguistic and anthropological studies with special emphasis on the languages and cultures of the Andean-Amazonian border area*, Indigenous Languages of Latin America Series 5 (ILLA), CNWS Publications 154, Leiden, 285–308.

Graham, A. C. (1980). Structure and License in Chinese Regulated Verse. *Journal of Chinese Linguistics* 8:1, 42–58.

Hyman, Larry M. (2009). How (not) to do phonological typology: the case of pitch-accent. *Language Sciences* 31:2-3, 213–238.

Jakobson, Roman (1970). *The Modular Design of Chinese Regulated Verse*. Échanges et communications. Melanges offerts à Claude Levi-Strauss à l'occasion de son 60ème anniversaire, Mouton, The Hague.

Jardine, Adam (2020). Melody learning and long-distance phonotactics in tone. *Natural Language & Linguistic Theory* 38, 1145–1195.

Kiparsky, Paul (2020). Metered Verse. *Annual Review of Linguistics* 6, 25–44.

Lorentz, Ove (1980). The Conflicting Tone Patterns of Chinese Regulated Verse. *Journal of Chinese Linguistics* 8:1, 85–106.

Maddieson, Ian (1978). Universals of Tone. Greenberg, Joseph H. (ed.), *Universals of Human Language*, Stanford University Press, Stanford, vol. 2: Phonology, 335–366.

McPherson, Laura (2016). Cumulativity and ganging in the tonology of Awa suffixes. *Language: Phonological Analysis* 92, e38–e66.

Napoli, Donna Jo (1989). A Metrical Grid Analysis of Chinese Regulated Verse. *The Penn Review of Linguistics* 13, 23–37.

Napoli, Donna Jo (1991). The tonal system of Chinese regulated verse. *Journal of Chinese Linguistics* 19, 243–293.

Odden, David (2000). Overview of African Tone Systems. Paper presented at Tromsø Tone Symposium, University of Tromsø, Norway.

Odden, David (2001). Tone shift and spread in Taita I. *Studies in African Linguistics* 30, 75–110.

Odden, David (2015). Bantu Phonology. *Oxford Handbook Topics in Linguistics*, Oxford Academic.

Odden, David & Michael R. Marlo (2019). Tone. Van de Velde, Mark & Koen Bostoen (eds.), *The Bantu Languages*, Routledge, London.

Parker, Steve (1999). A Sketch of Iñapari Phonology. *International Journal of American Linguistics* 65, 1–39.

Prince, Alan & Paul Smolensky (1993). Optimality theory: constraint interaction in generative grammar. Ms., Rutgers University and University of Colorado at Boulder.

T'sou, Benjamin K. (1968). Some aspects of Linguistic Parallelism and Chinese Versification. *Studies presented to Professor Roman Jakobson by his students*, Slavica Publishers, Inc., Cambridge, MA.

Wang, Li (1957). *Hanyu Shilü Xue [Chinese Versification]*. Xin Zhishi Chubanshe, Shanghai.

Wang, Li (1962). *Shi Ci Ge Lü (Poetic Metrics)*. Zhong Hua Shu Ju, Beijing.

Xue, Ping (1989). Prosodic Constituents and the Tonal Structure of Chinese Regulated Verse. *Linguistic Inquiry* 20:4, 688–696.

Yip, Moira (1980). The Metrical Structure of Regulated Verse. *Journal of Chinese Linguistics* 8:1, 107–125.

Yip, Moira (2002). *Tone*. Cambridge University Press, Cambridge.